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Original Communications

COLD INJURY IN KOREA

BY
Lieut.-Colonel J. C. WATTS, M.C., F.R.C.S.
Royal Army Medical Corps

In this paper is described the treatment of 152 cases of frostbite sustained by British Commonwealth troops in the Korean campaign in the winter of 1950-51.

Climatic Conditions

The climate of Korea in winter is very severe, and temperatures range from around freezing point to as much as −20° F. (52 degrees of frost); strong winds accompanied by snow, sleet, and hail occur.

Military Circumstances

During the greater part of the winter the two Commonwealth Brigades were fighting rear-guard actions or holding defensive positions, forward troops were either standing-to or sleeping in the open, and the lighting of fires was, of course, impracticable.

Clothing

Various forms of protective clothing were available, although some troops had only the standard boots, ankle, marching. Unfortunately, figures of the relative numbers of troops with the different forms of clothing were not available, so no appreciation of the relative merits of each type could be made ; however, cases of frostbite occurred in men wearing all types of protective clothing and it would appear that no type at present in use has any marked superiority.

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Clinical Features

In Forward Areas:

"*Early cases.*—Cold, well circumscribed area of pallor, painless with loss of epicritic and protopathic sensation. No circulatory return. This either proceeds to a bright red reactive warm stage with mild throbbing pain and the return of protopathic but not epicritic sensation, or to the:

"*Later stage* when the affected area goes blue with no circulatory return. All sensation is lost, the area is cold and there is a tendency to blister formation. Proximal to these areas are well demarcated zones of the reactive stage described above." (Kilgour.)

In the Base Area (i.e. one to five days after injury).

Cases were difficult to classify as there was a continuous grading from the case with no objective signs to those with black and shrivelled extremities. The following classification was adopted:

Incipient	Cases with no skin changes but complaining of numbness and paraesthesia.
Slight	Cases with reddening or brownish pigmentation and symptoms as above.
Moderate	Cases with vesiculation and/or patchy blackening.
Severe	Cases with blackened and shrivelled extremities.

Œdema was not a common finding, but some cases had very marked swelling, and resembled trench foot rather than frostbite; this factor is discussed below. In all but three cases the part involved was the foot, three cases had slight cold injury of the hands as well as the foot; no cases involving exposed parts of the face (i.e. ears or nose) were seen. The great toe was invariably affected, then in declining order of frequency the other toes, the fore part of the foot, the heel, the whole foot, and in only one case the leg above the ankle.

Treatment

Incipient Cases.—The literature on cold injury paints such a gloomy and alarming picture of the complications and prognosis that the first few cases were admitted and treated most actively along orthodox lines, but as our experience increased, and also as the numbers, both of cold injury and battle casualties, began to cause overcrowding, incipient cases were treated as out-patients, being discharged on the arrival of the convoy.

The treatment adopted was simple, consisting of contrast baths twice daily, and foot exercises repeated hourly. The patient should be assured that complete recovery is the rule in this stage.

Slight.—Cases with reddened and hyperhidrotic feet, sometimes also showing brown pigmentation, were kept in bed with the feet exposed to the air until blanching of the nails on pressure, with rapid return of colour on the release of pressure, indicated that the circulation in the foot was adequate. These cases

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were then treated as above. Hyperhidrosis was occasionally severe, but most cases responded to a simple foot powder containing one-sixth part of camphor. It was noticed that most cases showing marked hyperhidrosis gave a history of constitutionally "sweaty feet."

Hyperhidrosis was by no means universal and several cases showed anhidrosis.

Moderate.—Cases with vesiculation were given one million units of penicillin intramuscularly before being taken to the operating theatre, where, under sterile precautions, the blistered area was carefully and gently cleansed with Cetavlon and the dead superficial skin removed. It was noticeable how the underlying raw area changed colour from blue-black to red as soon as this was done.

The patient was then returned to bed and the feet were left elevated and exposed to the air, no dressings being employed, but penicillin therapy was continued until a flexible black crust had formed. Exposure to the air and recumbency were continued until the crust had flaked off, leaving a healed, pink surface, resembling a healed superficial burn. This took four to six weeks to occur, and separation was completed in six to nine weeks. As soon as it was clear that no loss of tissue had occurred, and the crusts had completely separated, treatment by contrast baths was instituted.

Severe.—Cases with blackened and shrivelled extremities. The initial treatment here was simply exposure and recumbency, with elevation of the limbs if œdema was present. Earlier cases received prophylactic penicillin, but this was discontinued when experience had shown that, as long as the part was dry, infection did not occur. Surgery was withheld until obvious separation of the tissues had commenced. The test devised by Lange and Boyd (injecting 10 ml. of 5 per cent. fluorescine in 5 per cent. sodium bicarbonate solution, and inspecting in a darkened room by ultraviolet light) was not employed as it is only claimed to be reliable if performed within fourteen hours of exposure, and our experience was that even in cases which appeared clinically to have complete dry gangrene of the fore part of the foot the degree of recovery was remarkable, and in one or two cases outstanding (see below).

Cases with Loss of Tissue.—When finally separation had commenced, the dead tissue was removed under general anæsthesia, any protruding bone was excised and immediate skin grafting performed, unless there was hæmorrhage from the tissues ; if hæmorrhage occurred, pressure dressings over tulle gras were applied and grafting delayed for two days.

Grafting was preceded by the administration of one million units of penicillin parenterally, and split skin postage-stamp grafts were used unless the area was small, when pinch grafts were used ; the grafts were laid on the raw area and no dressings of any kind were applied, the exposure being continued.

Earlier cases were dressed in a more conventional manner with pressure dressings, but experience with the exposure method in grafting buttock wounds had proved so successful that the exposure of grafts whenever possible is now my standard practice. It was considered that cases with loss of toes and cases with split skin grafting on the feet would not be likely to serve in a forward medical

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category for some time, and that further plastic surgery might be necessary, so, as soon as complete skin cover was achieved, these cases were invalided home.

Results

Incipient Cases (41 cases).—Adequate follow-up on these proved impossible, and in any case inquiry among officer patients revealed that numbers of such cases did not go sick, but remained with their units.

Slight Cases (32 cases).—Average length of stay in hospital was 9 days. Cases were temporarily downgraded to P3L3R for three months, and a recommendation made that they should not be employed in extremes of climate for this period.

Moderate Cases (61 cases).—Average stay in hospital was 36 days.

The disposal was the same as the slight cases, but it is probable that some of these will not be fit for upgrading at their next medical board in three months.

Severe Cases (18 cases).—Except for four cases, all these were evacuated from the theatre of operations. The average stay in hospital of the four cases ultimately returned to duty was 74 days, and all these cases were downgraded for six months.

Illustrative and Interesting Cases

Case 17, *Rifleman H.*—Frostbite sustained at Suwong, in South Korea, on 12th January. Admitted to base hospital, 14th January. Was wearing British field pattern boots with two pairs of socks, and was on guard in the snow in foggy, freezing weather. On admission he had severe cold injury of both feet, which were black, shrivelled, and apparently dead from the toes to the level of the mid-tarsal articulation. Treated as above he began to desquamate after 30 days in hospital. His evacuation was arranged, but owing to a hitch in the air evacuation he could not go until he had almost entirely healed, only the big toes still being covered with black crust. At his own request, he was removed from the evacuation convoy, as he wished to continue serving abroad, and after minimal grafting of the toes, he was eventually discharged on 27th April. The degree of recovery in the man was quite astounding, and it had originally appeared certain that he would lose all his toes and probably part of the feet.

Case 19, *Rifleman F.*—In the same platoon as case 17, and sustained his cold injury at the same time. On admission on 17th January he had severe cold injury of the fore part of both feet, not quite so extensive as case 17. He was treated as above, and, on separation of the first, second and third toes of the right foot being apparent, these digits were amputated at the metatarso-phalangeal joints, and immediate skin grafting performed on 1st March. Healing was complete by 14th March and he was evacuated to England on the 23rd. This case appeared originally to be less severely injured than case 17, and both feet appeared to be equally affected.

Case 20, *Rifleman A.*—In the same platoon as the two preceding cases, and injured on the same "Stand-to," but on his Field Medical Card was the entry by the Medical Officer: "*Incredible but true! this man went on guard in three pairs of socks only, as his boots were frozen to the ground.*" The patient confirmed this statement, explaining that he was unable to get his boots on, so had put on an extra pair of socks instead.

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After reading these notes it was with considerable surprise that examination revealed only moderate frostbite of the great toes, with minimal vesiculation and pigmentation.

He also had moderate frostbite of the fingers of the left hand, and full recovery of sensation in the hand delayed his recovery and he was not discharged to duty until 14th March. No skin loss occurred in this case, in spite of inadequate protective clothing.

Case 35, *Fusilier H.*—This man was the driver of a truck which broke down and he spent several hours during the night in the cab of his vehicle, crouched over the engine attempting to repair it. On alighting he found that he could not stand, and he was evacuated with cold injury, arriving two days after injury, on 23rd January. Clinically he presented the typical picture of trench foot, although he had been exposed to dry cold. The feet and legs were blue and grossly swollen and exquisitely tender. On elevation and exposure the swelling subsided in four days and the legs and feet were dry and painless. This patient was evacuated to England on 20th February for compassionate reasons, and I have heard that considerable skin grafting was required, but no amputation was necessary.

Case 74, *Private J.*—Injured on 15th January south of Inchon in conditions of severe cold with snow when he was on patrol wearing American "Shopaks" (a rubber and canvas laced half-boot of the "Lumberjack" pattern) and two pairs of socks. He had severe cold injury of the right second toe and both great toes, with moderate cold injury of the other toes. He was treated in the manner described above, but his recovery was delayed by his absenting himself and sustaining a venereal infection before healing was complete. Re-epithelialization and full recovery of sensation were complete on his discharge on 27th April.

Case 94, *Private McC.*—Sustained cold injury whilst on guard at Taegu on 15th January. Admitted to Osaka Hospital (U.S. Army) on 20th January and treated there with intravenous procaine, penicillin, intramuscular nicotinic acid and multivite pills. Admitted to 29 General Hospital on 22nd February with severe cold injury of both great toes and the fifth little toe, early separation being apparent. These digits were amputated on 3rd March, with immediate skin grafting; some further sloughing necessitated further skin grafting on 13th March, but healing was complete on his evacuation to England on 28th March.

Discussion

Cold injury has been the subject of much research, chiefly by American and Scandinavian workers, and the conditions known as frostbite, trench foot and immersion foot have been described. Cold injury does not occur ***until the tissue temperature falls below*** 15° C., vascular contraction does not occur until a temperature of 10° C. is reached, and freezing of the tissues does not occur until the tissue temperature drops to −2.5° C. (Stray). Full recovery is possible even after freezing provided that the oxygen requirements of the tissues at no time exceed the supply; thrombosis is not a feature of cold injury unless infection or necrosis supervenes, but the phenomenon of "conglutination" (Blackwood), when the capillaries become blocked with a solid plug of cells, left after the exudation of plasma, is responsible for the damage which occurs on recovery from cooling. Recent experimental work (Finneran and Shumacker) suggests that the best degree of recovery is obtained by the rapid warming of the tissues to blood

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heat or slightly above, but the application of this to first-aid measures in the field is of doubtful practicability. Briefly, frostbite occurs when relatively ischæmic tissues are subjected to rapid cooling, and trench foot when a dependent and engorged limb is subjected to slow cooling in mud or water at or near freezing point. It is felt the conditions in Korea, where troops were continuously in the open and exposed to intense cold by night, but only moderate cold by day, gave rise to a form of cold injury intermediate between frostbite and trench foot, not hitherto described, and affecting the lower limb almost exclusively.

The prevention of cold injury is simply the maintaining of an adequate tissue temperature, and this can be achieved in two ways—(*a*) by preventing heat loss and (*b*) by increasing heat production. The prevention of heat loss in conditions such as Korea is more difficult than in true arctic conditions, as completely insulated and impervious clothing leads to increased sweating during the relatively warm hours of daylight, and as the sweat cannot evaporate, the feet, being wet, will freeze at night ; greater attention should therefore be paid to increasing the warmth of the tissues by avoidance of constriction, and the routine performance of foot exercises. Case 20, it is felt, illustrates the importance of avoiding constriction and of allowing free movement of the feet, as this man, in totally inadequate clothing, was less severely injured than some of his comrades.

The forward treatment of these cases was by preventing further trauma to the affected part and the slow restoration of circulation by : (*a*) Removing the casualty to warm shelter ; (*b*) application of warmth to the body ; (*c*) no attempt to apply heat directly to the affected part ; (*d*) keeping the affected area dry ; and (*e*) protecting the area with cotton-wool against trauma in transport. (Kilgour.)

The treatment outlined above for cases after their arrival at the base hospital was adopted for a number of reasons, principally because it was felt that, by the time that these cases had arrived in hospital, recovery had commenced and that rest and the avoidance of infection were the primary requirements. Heparin was not exhibited as our supplies were extremely limited, and the available literature stressed that thrombosis is not a common concomitant. Vasodilators were not employed as all cases showed marked clinical vasodilatation, and the place of these drugs in the condition is not yet proved ; for the same reason, smoking was not forbidden. Sympathectomy has been shown to have no value, and indeed some authorities state that it is harmful ; it may have a place in the treatment of severe causalgia, but none of our cases exhibited this sequela. As indicated above, a number of cases had tender feet which necessitated their being temporarily downgraded into a lower medical category.

Incidence

Incidence of cold injury among the wounded was not at all marked, except among the Marine casualties in the retreat from the Chosin Reservoir ; and, excluding these cases, only two wounded men also exhibited cold injury, both being classified as slight. As was to be expected, the incidence was greatest in the infantry, with a rate of 2.13 per cent. and a range of from 7.82 per cent. in one battalion to 0.65 per cent. in that at the other end of the scale. Other troops had

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an over-all ratio of 0.37 per cent. with a range of from 1.54 to 0.12 per cent. Although a greater incidence was expected in older troops, this difference was not marked, and the battalions composed of recalled reservists were all below the average; similarly there did not appear to be a marked difference in the degree or time of recovery in the older men.

Conclusions

With adequate clothing and training, the incidence of cold injury, even under extreme conditions, can be kept down to a relatively insignificant figure.

A simple and conservative line of treatment gives a high proportion of recovery.

Recovery is, however, slow, and most cases must be regarded as non-effectives for a period of months.

Surgery, in the absence of infection, has no place in the early treatment, but should be delayed until the death of the tissues is clearly evidenced by separation of the dead tissues.

Apologia.—It is regretted that the above account is not as detailed or as informative as I could have wished, but during the time that these cases were under treatment some 800 battle casualties were admitted, in addition to the usual accidentally injured and sick cases from the Commonwealth force.

Summary

The management of the cases of cold injury occurring in the Commonwealth troops fighting in Korea in the winter of 1950-51 is described and the mechanism, prevention, and treatment of cold injury discussed.

Acknowledgments

I should like to express my thanks to Captain J. Kilgour, M.B., R.A.M.C., for providing me with details of the clinical features and treatment of the cases in forward areas; to Colonel J. E. Snow, *O.B.E.*, Commanding 29 General Hospital, for his support and encouragement; to my colleagues in B.C.O.F. 29 General Hospital for their assistance; and to Brigadier A. G. Harsant, *O.B.E.*, M.S., F.R.C.S., Consultant Surgeon to the Army, for permission to submit this article for publication.

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BITING INSECTS IN THE ARCTIC AND SUB-ARCTIC

BY

Lieut.-Colonel R. A. SMART

Royal Army Medical Corps

INTRODUCTION

THE difficulties of living in the Arctic in the winter are matters of general knowledge. It is perhaps not so well known that there are quite different and very acute problems during the summer season. The most serious from the medical aspect is attack by biting insects—mainly mosquitoes and blackflies. The degree of this menace is difficult to imagine, unless one has experienced it personally. Mosquitoes have been termed the most serious single obstacle in the way of man's subjugation of the north, and it has even been asserted that there are probably ten times as many mosquitoes in the Arctic as there are over any equivalent area in the tropics, or any other place on earth. Whether this is the case or not, they certainly present a serious problem, and one which is essentially similar in northern latitudes in the New and in the Old World.

It was felt that experience and information were limited in this country, and therefore it was decided, largely at the instigation of Professor P. A. Buxton, of the London School of Hygiene and Tropical Medicine, to send a small party to Northern Canada and Alaska in the summer of 1950. The party consisted of Mr. J. A. Downes, of the Department of Entomology, University of Glasgow, and the writer.

During the latter part of the visit we were joined by Professor Buxton.

GROUND COVERED DURING THE VISIT

We arrived in Ottawa on 18th May, 1950, to find that a very detailed and extensive programme had been planned for us. Ninety per cent. of the journey was by air transport, otherwise we could not possibly have completed our programme within the time available. A very brief account of the journey, and the type of work observed in various locations, follows. We visited first the R.C.A.M.C. School at Camp Borden, Ontario. Work in progress here included trials of ground aerosol generators, and fundamental research as to why mosquitoes are attracted to human beings. We spent four days in this location, then moved on, by air, to Suffield, Alberta. On the way we passed over Winnipeg, and had an impressive view of the Red River floods. Our visit to the Suffield Experimental Station was specifically to the Entomology Section, where we saw work on aerial spraying technique, trials of ground aerosol generators, and

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control of body lice. All of these projects were of importance from the Army health aspect.

From Suffield we went to Lethbridge, to visit the Department of Agriculture Science Service Laboratory. The main field of research here is concerned with insects which attack field crops and livestock. Although not directly connected with the purpose of our visit to Canada, the work which we saw being carried out was of considerable general interest.

The next stage of our journey took us to Whitehorse, Yukon Territory. We spent only one night in this famous old gold-rush town before taking off for Alaska. We were to see more of Whitehorse later. The flight to Fairbanks, Alaska, was quite a spectacular one, over snow-covered mountain ranges. On the way we passed over goldfields with well-remembered names—Eldorado Creek, Bonanza Creek, Klondyke—and touched down for an hour at Dawson City. Then to Fairbanks, a journey giving a fine aerial view of different types of Alaskan terrain. So far we had been travelling on civilian air lines, but now we switched to U.S. Military Air Transport Service, and so went on to Anchorage, in the south of Alaska. Our purpose here was to visit the Alaska Insect Control Project. This team has been engaged on an intensive investigation of the biting-insect situation in Alaska each season since 1947. Unfortunately, our visit did not coincide with their aerial spraying programme, but we did see trials of ground aerosol generators of various types. We travelled with the team northwards by jeep, from Anchorage to Big Delta, and on the way, for the first time, we experienced really considerable numbers of mosquitoes. Standard repellents gave us good short-term protection.

We spent about a week in Alaska altogether, then returned to Whitehorse, Yukon Territory, to observe aerial spraying. Whitehorse is a military and air force station, and some method of mosquito control has been found necessary to make life bearable for families stationed here during the summer season.

After two weeks in Whitehorse, we moved on again, this time to Saskatoon, in order to collect information on blackfly control in the Saskatchewan River. From here we went by way of Winnipeg to Fort Churchill on Hudson Bay. This is a large military establishment where research work on winter and summer Arctic problems is pursued all the year round. A very considerable volume of work is being undertaken here, including studies on the biology and control of mosquitoes, their habits, flight range, source of blood meal, control by aerosol generators, and so on. Work was also being done on the relationship of blackfly activity to meteorological conditions.

We had therefore an opportunity of observing a wide range of projects. We spent two weeks here, of particular interest to me as I had been stationed at Churchill under winter conditions the previous year, and so had an opportunity of getting to know this type of country both in winter and summer. Our visit here coincided with the peak of the mosquito season. Now for the first time we had personal experience of the full severity of the insect pest. Intensity of mosquito attack may be expressed by stating the biting rate. This is the number of bites recorded on one bared forearm in 60 seconds. During the peak of the

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season at Churchill, rates of 30 to 50 were characteristic, and 180 was recorded. At the end of our stay in Fort Churchill, my part of the tour was ended, and I went on to Montreal for an equipment conference. Downes went on to Goose Bay in Labrador, where he was joined by Professor Buxton. Here they observed tests of repellents and protective clothing, experiments in control of blackfly, and a variety of other work. This completed the itinerary of the team. We were impressed by the considerable amount of work going on, and by the extensive and well co-ordinated programme.

In the following paragraphs I will describe what we learnt of the problem, and the various means of overcoming it.

The Biting Insect Problem

The two major pests are mosquitoes and blackflies, although culicoides (biting midges) and tabanids (clegs, horse flies, deerflies) may be a nuisance in certain localities. C. R. Twinn has published a general review of the subject [1]. Mosquitoes are ubiquitous over the North, and exist in unbelievable numbers. It is almost impossible to pick up a book on Arctic summer travel which does not refer to the exceptional nature of this pest.

Vilhjalmur Stefansson, who lived for five or six years with the Eskimo, and endured several hard winters, wrote : "It is true that on our entire expedition, we had no experience that more nearly deserved the name of suffering than this of combined heat and mosquitoes of our Coppermine River summer" [2] (on the Arctic Ocean). He also complains that he has found it difficult to shoot a rifle because of mosquito attack. I myself have walked along the shores of Hudson Bay, wearing a light windproof jacket with the hood up, and heard the mosquitoes pattering on the hood like drops of rain. Even local dogs are affected, sometimes going blind from stings round the eyes, and lame from stings round the junction of the hair and pad.

The mosquitoes are almost without exception various species of Aedes : on the tundra, *Aedes nigripes* and *nearcticus* ; in the forest, *Aedes punctor* and *communis* ; are perhaps the most frequently met with, but there are many other important species.

The reason for the astronomical numbers which prevail has not been definitely ascertained. One thing is certain—there are a very great number of breeding places. Permanently frozen ground (permafrost) a few feet below the surface means that there is no subsoil drainage, and therefore there are a vast number of surface pools where mosquito larvæ are found in great abundance. These pools exist all over the northern tundra, and also farther south in forest areas. The question is inevitably posed, Where do the adult mosquitoes obtain their blood meal ? It is true that there are fair populations of lemming, vole, muskrat, weasel, arctic hare, ptarmigan, some small birds, a few humans, huskies and a small number of large mammals, but it is obvious that the host population is inadequate to sustain the mosquito population. In fact, the probable answer is that some mosquitoes can produce eggs without a blood meal, and work to substantiate this is in progress at Fort Churchill.

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The mosquito season is intense, but fortunately short. The winter is passed in the egg stage, underneath the ice and snow.

Hatching starts soon after the snow melts, and rapid larval growth follows, terminating in a mass emergence of adults. Various species come out at different times, but generally speaking the mosquito population builds up in late June, and then there is a gradual decline until late August, when the last adults are usually seen.

The farther north one goes, the shorter the season. Mosquitoes have been found as far north as 75 latitude. They bite at all times of day and night, and, in brief, are an intolerable nuisance.

Blackflies are not quite so widespread a problem. Not all species attack man. Most blackflies live within the belt of northern forest, and the species found in the tundra do not bite man to any serious extent. They breed in running streams and rivers, over-wintering as an egg, emerging as an adult some weeks later than a mosquito, but remaining a nuisance later—sometimes into October. They are day biters, and have an awkward habit of crawling up trousers and sleeves in order to bite. Their flight range is considerable, and they have been found in large numbers up to 100 miles from any possible breeding place.

Tabanids—familiarly known as horse flies, deerflies or clegs—are widespread, but become important pests only rarely. *Culicoides*—biting midges—sometimes called punkies or no-see-ums, are also a local nuisance. We are, of course, familiar with this pest in Scotland.

Effects of Insect Attack

There is nothing unusual about the bite of the northern mosquito. It is irritating, and produces a local reaction. Bites are often scratched, leading to septic skin conditions. Blackflies sometimes cause more intense and lasting reactions than mosquitoes, and mass attack can sometimes cause the death of cattle. Bung-eye—a large swelling round the eye—is a disabling condition which can be caused by a single bite.

Transmission of diseases is not known to occur in the areas in question. However, it is believed that northern mosquitoes are capable of carrying tularæmia, and there are types of equine encephalitis in Canada which are mosquito-borne, so there are certain possibilities which should not be forgotten.

Psychological effects of intensive attack by biting insects are hard to assess. In practice, no one is completely unprotected.

If there was no protection, certainly one's equanimity would be profoundly upset. Every activity would be interrupted and sleep made impossible. A certain amount of study has been devoted to the effects of biting fly attack upon the output of work in the north, but the results have not been very conclusive. Different individuals react, of course, in different ways. I have no doubt myself, after having experienced these conditions, that life would be a misery unless one were protected, efficiency would be greatly impaired, and some individuals at least would be unable to carry on.

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Control

There are two aspects of the control problem. The first is protection of an area—for example a town, aerodrome, or military camp. The second aspect is the protection of a mobile party, or small isolated military post.

Area control is carried out by spraying the area with D.D.T., which still remains the insecticide of choice for this purpose. It may be done from the ground with an aerosol generator, for example the T.I.F.A. (*Todd Insecticidal Fog Applicator*), or by spraying from the air.

A great deal of work has been done in Canada and Alaska on the technique of aerial spraying, and considerable experience has been accumulated by pilots and by the planners of control schemes [3, 4]. Aerial spraying can be done for the purpose of killing larvæ, or for adult control. Larviciding seems a fundamental protective measure, but the drawback is that infiltration of adults from surrounding untreated areas occurs at such a rate as to make the larvicidal treatment nugatory. For this reason, aerial spraying, at any rate in North America, is usually directed against the adult. However, there is one interesting aspect of larval control which should be mentioned. This is "pre-hatching treatment" [5].

The snow surface is treated before the thaw. When the thaw begins and the larvæ hatch out, a kill is obtained which is comparable with the conventional method. The advantage of the system is that insecticide can be applied from the ground while the surface is still hard and frozen. After the thaw, insecticide can only be applied from the air in many areas, because of the difficulties of getting vehicles across the marshy terrain. The usual dosage aimed at is 0.25 lb. D.D.T. per acre for larval control, although rather higher dosages may be required for the pre-hatching treatment. Smaller dosages have been found to be effective as a result of modifications in technique.

As already stated, adult control is now preferred. This is achieved by applying D.D.T. as soon as nuisance numbers of adults have emerged. In Canada the usual dosage used is the same as for larvæ, namely 0.25 lb. per acre. Smaller dosages have been found effective in Alaska, using a rather different spraying technique.

Spraying is repeated as required. Length of time for which one spraying remains effective depends very much upon the climate and local circumstances. Control can be maintained throughout the mosquito season by repeating the spraying as often as may be necessary ; this is an effective but expensive method of protecting the inhabitants of an area from mosquito attack. Despite its efficacy, the necessity for mosquito-proofing living quarters still exists if comfort is to be assured. It should be emphasized that considerable knowledge and experience is required to plan and carry out aerial spraying. In North America, various effective techniques have been established and widely applied.

Insecticidal fogs can be applied from the ground by various types of apparatus. Most big military camps in Canada are equipped with a T.I.F.A. We also saw a machine operating on the jet principle (the Dynafog) which was light (about 90 lb.) and effective, but noisy. Lastly we saw aerosols generated by allowing

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insecticides to flow into a venturi in a vehicle exhaust system. Using any of these methods, spraying is carried out whenever adult insects reach nuisance proportions, and in this way control can be maintained throughout the insect season.

It is, however, not always possible to cover a wide area around camps, as most types of ground generator are confined to the roads.

Blackfly control can also be effected by measures against larvæ or adults. Studies on the control of blackfly have been carried out at Fort Churchill [3] and subsequently in a large river, the South Saskatchewan [6]. One part D.D.T. in 10 million parts of water, maintained at the point of application for fifteen minutes, has been found to be effective in killing blackfly larvæ. This dosage has been applied without any ill effect on fish, a point which is of economic importance. Treatment of this sort cleared out blackfly larvæ from 100 miles of the South Saskatchewan in 1949. The problem is, of course, very much more difficult in the North, where the insects are breeding in large numbers of small streams. However, even this problem has been tackled successfully in Goose Bay, Labrador. A certain measure of adult blackfly control is usually attained in the course of aerial spraying operations against mosquitoes, but effect is noticeably less against blackfly. More effective blackfly control might be attained by using a smaller droplet size.

Control of tabanids has not been seriously undertaken, and biting midge control has seldom been necessary. In Alaska, however, adult midges have been controlled by the use of D.D.T. from ground generators.

All of these measures of control can be effectively applied in a fixed area—camp, airfield, or town. They are obviously not practicable, or economic, in the case of small mobile parties or small isolated posts (both typical military situations). In such a case, individuals must rely upon measures of personal protection. This implies the use of protective clothing, insect repellents, insect-proof bivouacs, and some form of hand-operated insecticide dispenser.

Insect-proof clothing should be of thin, light, closely woven fabric, suitable for summer wear. In the past, dwellers in the North wore several thicknesses of clothing, preferring the discomforts of heat to insect bites. Various types of insect-proof fabrics have now been produced, and the writer's experience of being severely bitten through a thick flannel shirt leaves no doubt in his mind that clothing of some such material should be provided.

The jacket should have a hood to protect the head and back of the neck. Head veils have certain disadvantages ; nevertheless, wide-mesh veiling used in conjunction with D.M.P. gives good protection, and does not interfere markedly with visibility.

A good repellent is an absolute necessity. In our experience, D.M.P. gives good protection against northern mosquitoes. The duration depends upon the activity of the individual to a large extent. If one is hot, and sweating freely, it does not last long, and has to be renewed. 6 : 2 : 2 mixture (D.M.P. : Idalone : Rutgers 612) is also widely used, and gives good protection. Insect-proof shelter, where men can obtain adequate rest and sleep, is required. One must have either a mosquito net to sleep under or an insect-proof bivouac. In con-

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junction with the shelter, a hand-operated insecticide dispenser to kill off those mosquitoes which manage to enter is required.

Given these requirements, a small mobile party or a small isolated post can operate without grave discomfort.

Conclusions

It is obvious that operations in far northern areas present considerable difficulties. There are special environmental problems to be faced in winter and in summer, with requirements for clothing and equipment.

One does not wish to exaggerate the intensity of the biting insect problem in summer, and it must be conceded that Europeans have lived and travelled in these areas for very many years with no protection, or only primitive protection, against insects.

Nevertheless, extreme discomfort results, which would, it is believed, adversely affect the efficiency and morale of troops.

The biting insect nuisance in northern areas in summer should be remembered if troops are required to serve in such areas, and suitable measures must be taken to minimize it.

Briefly, fixed bases can be protected by widespread aerial spraying with D.D.T., preferably directed against adult insects.

Small mobile parties must rely on personal measures of protection, such as insect-proof clothing, repellents, insect-proof shelter, and hand-operated insecticide dispensers.

Our party was given every facility to observe the very considerable volume of work in progress, and in conclusion I should like to express my appreciation of the helpfulness, kindness and courtesy extended to us by the Canadian authorities at all levels.

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SHORT-TERM PSYCHOTHERAPY IN THE TREATMENT OF ASTHMA

BY

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THE symptom complex of asthma when found in Service personnel may often present difficulties in the problems of treatment and disposal. Protracted and frequent hospitalization, the threat of acute recurrences and the necessary restrictions in employment may do much to affect adversely the career of a Regular soldier, who, until the onset of his disability, has probably given long and efficient service. Where in these cases there are minimal pathological changes in the respiratory system and where the relationship to allergy is vague and indeterminate, the tendency of the modern physician is to emphasize more and more the significance of emotional factors in the ætiology of the disease.

It has been known for nearly three hundred years that the manifestations of asthma were clearly related to the state of the "nerves" in the sufferer, but it is only in the last twenty years that the psychosomatic aspects of this condition have been scientifically established. British psychiatrists have made valuable contributions to the early studies of that group of diseases comprising asthma—migraine, hay-fever, colitis and prurigo. Wittkower [1] suggested that the large majority of asthmatic conditions had a twofold causation. There was, on one hand, the person with an allergic predisposition in whom emotional conflict acted as a trigger to activate the latent asthma, and, on the other, the constitutional neurotic who was subject to asthma of true allergic origin. In the same year Rogerson, Hardcastle and Duguid [2], when investigating asthma in children, wrote that the hallmarks of the asthma-prurigo personality in young patients were "High intelligence in verbal tests with poorer performance ability ; marked over-anxiety with a lack of self-confidence ; considerable latent aggressiveness and egocentricity." A year later in a classic paper Gillespie [3] stated : "An idea may become the affective stimulus which elicits the asthmatic response just as much as pollen or horsehair." He observed that asthmatics generally exhibited a neurotic type of personality long before the onset of the asthma, and that the asthma itself could be replaced by anxiety, could express a conflict between impulse and conscience, and was often a protection against or a mode of escape from an intolerable situation.

The psycho-analytic approach as exemplified by French [4] to the problem of asthma produced the observation that one of the common features in asthmatic patients was the fear of family disruption arising from a sexual urge towards the

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parent, with the resulting emotional conflict and the threatened loss of parental love. The reaction to this threat was a repressed cry of fear and frustration, symbolized in the asthmatic attack. Utilizing the Rorschach projection test, Schatia [5] stated that his findings confirmed the impression that asthmatics tend to have compulsive personalities without evidence of phobias or compulsions. Weiss and English [6] assert that a large number of asthmatic children are over-anxious and insecure and that they are divided into two distinct groups. There are the over-protected only children, usually boys, who have been very much wanted by the parents, and there are the unwanted children, whose parents compensate for their repressed hostility towards them by excessive solicitude and attention. Dunbar [7], when discussing adult asthmatics, refers to them as being either smiling and unruffled or openly dependent and emotionally unstable.

Whilst most of the literature with its valuable contributions to the understanding of the psychopathology of asthma has been concerned with children and psychoneurotic adults, very little has been described of this condition in institutionalized mental patients. Prout [8] in a recent informative paper has made a brief survey of the relevant published material and has described a small number of cases of asthma occurring in psychotics under his care.

In the treatment of asthma the aid of the psychiatrist is enlisted in the majority of cases only after there has been a diminishing satisfactory response to routine drug therapy and when the patient has become discouraged and set in the habits of illness. In certain early selected cases psychotherapy can be of marked value. From the service man's point of view deep analysis is unpractical. It takes too long, may interfere seriously with the military life of the patient and restrict his normal activities, and in general is not justified by the results, occasionally complicated by the emergence of some florid psychotic manifestations. But a superficial psychotherapy of a more dynamic nature which attempts for the comprehension of the patient to equate the appearance of the asthmatic symptoms with the co-existing life situation may in a few brief sessions achieve considerable improvement.

The two following cases, seen and treated by the writer, are quoted because they have many points in common, exhibit characteristic features of the asthmatic personality and history, and because they have responded sufficiently well to psychotherapy to return to responsible military employment without further complaint.

Cases

Case 1, *A.B.*—Male. Age 36½ years. Major. Infantry, 12 years' service. Married.

Medical History.—Twenty-five years' history of mild bronchial asthma without any great disability. First severe attack of asthma in November, 1945, followed by recurrences in February and March, 1947. Between May and September, 1949, his condition was such as to interfere seriously with his work and confine him to bed. The therapeutic response to ephedrine and allied drugs had become decreasingly effective. Each attack was preceded by a mild urticarial reaction and hot "flushes." Skin tests for allergens were variable and non-specific. There was no family history of asthma.

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Personal History.—The only son and the second eldest in a family of four children, he was reared in a comfortable upper middle-class environment and had a conventional education as a day-boy at preparatory and public school. Of average ability he passed School Certificate at 15 years and left at the age of 19 years. Three years were spent in a large factory as a trainee-executive, but he always had the Army in mind as a career. Commissioned in the S.R. in 1936, he was appointed to a Regular commission in 1938, in which year his father died. As a junior officer he took part in the evacuation of Dunkirk. In 1942 he graduated from the Staff College, and it was at this period that he found it necessary to control his asthma by injections of adrenaline. He had been married in 1941. From 1943 to 1949 he served as a G.S.O.2 on active service overseas, and in Staff appointments in the U.K., where his work was exacting and specialized. During this period his wife and children were living with his mother, and there were many difficulties with unexpressed resentment on both sides. After attending a special and intensive course in 1949 he was appointed an inter-service liaison officer overseas. Almost immediately his asthma became worse and seriously interfered with his preparation of an important memorandum for his General, resulting in his evacuation to U.K. for treatment.

Psychiatric Examination.—He was an intelligent and ambitious individual with a high level of aspiration, but with no great confidence in his own ability to attain the high standards he had set for himself. He anticipated any failures by adopting a self-depreciatory attitude, was much too anxious to be in the good graces of his seniors, and had learnt to suppress completely any overt expression of resentment or disapproval. He exhibited obsessional and egocentric traits, and found it difficult to relax away from his work. For the greater part of his life he had been dominated by his mother, and treated her with great respect and admiration if not with any marked affection. It was elicited that of late his asthma had become worse when spending the week-ends with his wife, and this was associated with a loss of sexual potency. The other important fact was that he had assumed his new appointment with some trepidation, since the officer he was relieving was noted for his outstanding professional record, his numerous social graces and his good standing with the senior officers at the H.Q. Whilst in hospital this officer was a passive, amenable patient who did everything to co-operate with the medical staff, and who gave the impression that he was sorry for causing any inconvenience but felt he was putting up a good show in the face of many difficulties.

Case 2, *X.Y.*—Male. Age 40 years. W.O.II. Infantry. Service 21 years. Married.

Medical History.—This warrant officer had suffered from a mild degree of bronchial asthma for 18 years, but only complained of severe and disabling asthmatic symptoms following a perforated appendix in December, 1949. For three months he had been totally unemployed owing to his dyspnœa on exertion. There was no family history of asthma, and all the skin tests were indecisive and unreliable for specificity. He had been referred to a psychiatrist for the first time early in 1951.

Personal History.—The oldest of five children, his early life was spent in the company of the others in a convent, in which they had been placed by a war-widow mother who was unable to support them. He felt himself responsible for his brothers and sisters. Leaving the convent at the age of 14 years to enter domestic service, he lost contact with the rest of his family. For various reasons he disliked his new life and enlisted in the Army although under age. His subsequent career was satisfactory, resulting in slightly accelerated promotion and a reputation for conscientiousness that

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earned him throughout the regiment the soubriquet of "Methodical T——." By 1939 he was a Sergeant, and later became a P.T.I. In 1942 he refused an immediate commission as a Q.M. because it might have meant leaving his wife, from whom he had already been separated a long time, and he also felt that as an officer he would have to adopt certain standards of living, which he did not think himself capable of maintaining. Since then he had been employed in U.K. in various capacities as an instructor. His last employment, which he disliked intensely, had been on a Travelling Team, where there had been constant movement, irregular hours and meals, indifferent lodgings and frequent long separations from his wife and child.

He had been married 13 years, had one son (5 years), and was happily married. There was no family history of asthma or allergy, but the wife suffered from "heart-trouble," which was probably of psychogenic origin.

Psychiatric Examination.—A sparsely built, grey-haired man looking older than his years. The inspiration in breathing, which appeared to be forced and unnatural, was directly related to the degree of emotional stress and the extent of medical observation. Of average intelligence, he had initially very little insight into the nature of his symptoms, and was egocentric to a marked degree. A passive, co-operative hospital patient, his attacks of breathlessness were almost theatrical in quality. Over a series of interviews investigation revealed the following factors :

1. A life-long craving for security, affection and popularity.

2. Extreme dependence upon his wife, with an associated resentment both at himself and at her for his great need of her moral support. At one stage he admitted that he had often felt "like throwing her out of the window."

3. Resentment at his early rejection by his mother.

4. A degree of suppressed envy of his less capable contemporaries who had reached commissioned rank. He always suspected that they might attempt to be patronizing towards him.

5. An obsessional attitude in providing for the welfare of his wife and child by expending money on elaborate long-term financial insurances.

6. His vehement dislike of his most recent employment, and his resentment on that basis at his Commanding Officer.

Comments on the Case Notes

In the histories of these two patients of widely differing social environments and professional backgrounds there are striking similarities. In both there was at the outset strong scepticism at the suggestion of any psychological causation of the more severe symptoms. Both were the responsible male members of their respective families after the death of the father. They strongly denied, when first questioned, any difficulties in their married lives, but later volunteered the information of long-standing grievances against their wives. Frequent irritable outbursts were followed by immediate reconciliations with over-compensation for mild guilt-feelings. Although capable and conscientious in their respective spheres, they had both rigidly suppressed their critical faculties in regard to the actions of authority, and gave the impression of being over-disciplined and too conscious of their own possible shortcomings. When in hospital they were both

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"good" patients who were content to sit around and wait for something to be done. There was in each case an identical need for liking and acceptance by contemporaries and commendation from superiors. Asthma, when it appeared in these patients, was undoubtedly and fundamentally a protective mechanism.

Treatment and Progress

The first interview in each case was devoted to neutralizing the passive psychological resistance, which always seems to be present in patients of this type on being referred to the psychiatrist, to establishing a good rapport, and to a brief but lucid and non-technical explanation of the effect of emotional stress on physiological function. A detailed life history was then taken, and particular attention was paid to those stress-points which seemed to be significant, but which invariably tended to be glossed over in the patient's own story. The subsequent procedure was dictated by the rate of progress, the facilities for out-patient treatment, and the intellectual grasp and capacity for insight of the individual. The crucial point appears to be when the therapist has gained the confidence of the patient who perhaps for the first time in his life is able to relax the guards on his emotional expression and "get things off his chest." He is generally surprised and almost shamefacedly self-conscious when confronted with the evidence of his antagonistic reactions towards people and principles, which all his life he has been indoctrinated to respect and hold in regard. The efficacy of this type of emotional revelation has already been recognized by French and Johnson [9], who postulated a dynamic relationship between confession and asthma.

Case 1.—In the opinion of the writer this officer was of an allergic predisposition, but his acute attacks were precipitated by emotional crises. It was decided to make use of his logical and staff-trained mind to assist in his own treatment. First the week-end asthma was related to his psycho-sexual impotence with its vicious circle of apprehension of further impotence. This disability itself was explained on the presence of definite intra-family tensions, with the recognition of the patient's divided loyalties to his mother and wife. When he had really appreciated these factors he was asked to make a life chart paying special attention to the time relationships of his acute asthmatic attacks. This type of chart, as explained by Harrowes [10] and based on the dynamic psychiatry teachings of Adolf Meyer, correlates somatic illness with age, occupational stress, leisure activities, social adaptation and sexual maturation. It was immediately obvious when this chart was completed that the severity of each attack was directly proportional to the degree of newly assumed responsibilities in his professional and domestic lives. Recognition of this dependent reaction led to a physical improvement, sufficiently marked to allow him to return to duty. In view of the true allergic element in his condition he was instructed in breathing exercises by the physiotherapist, and advised to continue with the occasional use of his prescribed anti-spasmodic drugs.

He was seen on three successive occasions at fortnightly intervals and his progress was rapid and uninterrupted. Accommodation for his wife and children was found well away from his mother, and his marital adaptation was satisfactory. His recovery was considerably hastened when he learnt that the brilliant officer whom he had

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relieved in the staff appointment was humanly frail and had been found responsible for some major administrative faults. Since his last interview many months ago he has been in full and efficient employment without any complaint of disabling symptoms.

Case 2.—This warrant officer was considered to be a constitutional psychoneurotic in whom the dyspnœic symptoms were embodied as a hysterical mode of expression. At the end of the first interview the response in this patient, who previously could walk the length of the ward only with difficulty, was even more marked. He stated, "I haven't felt so well for a long time. I don't know what you've done, but you seem to have hit the nail on the head," and walked without distress along the whole length of a long hospital corridor to his ward. He accepted the psychological interpretation of his symptoms and was allowed to read a book on psychosomatic medicine for the layman by Dunbar [11]. This was followed by a slight relapse, probably due to the recognition that he was neither as self-sufficient, independent nor adult as he had imagined himself to be. After two further interviews at intervals of a few days he was sent on sick leave and returned to his Depot, where, through the good offices of the Commandant, he was retained on the permanent instructional staff and allowed to live out with his family. Although such rapid recoveries are often suspect, this patient has made no further complaints, is working well, and should continue to do so until the termination of his service.

Summary and Conclusions

A very brief summary is made of the more important contributions to the literature of asthma and psychiatry.

Two cases are described of long-standing asthmatic syndromes in military personnel, with comments on predisposing emotional stresses, treatment and progress.

It is concluded that in certain selected cases of asthma, where psychological factors are predominant, short-term psychotherapy initiated in hospital and continued in an out-patient clinic may achieve immediately satisfactory results, shorten the periods of hospitalization and absence from duty, and restore valuable personnel to full and efficient military employment.

I am indebted to Colonel F. J. O'Meara, M.A., M.D., F.R.C.P.I., D.T.M.&H., late R.A.M.C., Commanding Officer, The Queen Alexandra Military Hospital, Millbank, for permission to submit this article for publication.

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REQUIREMENTS OF A MILITARY HOSPITAL

BY

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INTRODUCTION

It is the object of this paper to set out the requirements that should be met in planning a modern military hospital, or any part of it. The paper is set out in the form of an *aide-mémoire* and is therefore necessarily somewhat dogmatic in its statements. With a few exceptions, no discussion is developed of the various considerations which have formed the basis of the recommendations set down. Space alone would forbid that being done, and since this paper is intended merely to be used as a handy reference for those who need it, the inclusion of such matter is felt to be unnecessary, since that would be outside its scope.

Brief discussion is, however, given to the various considerations regarding layout, especially in connection with basic types of ward design and with "horizontal" and "vertical" types of construction.

Apart from mention of the need for provisions of air conditioning in certain departments in tropical climates, no consideration has been given to any special requirements arising from climate, and the suggestions made are for a normal military hospital in a temperate or at worst subtropical climate. *Neither has any mention been made of such matters as lighting, ventilation, heating, siting or communications, although it is recognized that they are fundamental factors in the design and layout of accommodation in hospitals.* These, together with consideration of the special factors affecting military hospital design as compared with civil hospital design, will be the subject of another paper now in preparation.

PART I—GENERAL CONSIDERATIONS, ENTRANCES AND EXITS

General Considerations

Layout

For planning purposes, a hospital in the modern conception consists of a number of functional units related to each other in different ways. Their relationship to each other is a key factor in planning the hospital. The relationship of these units to each other has also to be balanced against factors arising from the nature of the site, the climate, local building restrictions, the size of the hospital (number of beds), and the costs of installation of services such as lifts, steam, gas, electricity, heating, water, drainage and roads. Only the outcome of this examination can determine whether any particular hospital should be of a particular

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"type." No one type can be said to be ideal for all purposes and there is no such thing as the "modern type of hospital." In certain places there are distinct advantages to be derived from the use of single-storey pavilions spread over a relatively wide area. In others all the advantages lie with single-block construction of several storeys. *No attempt should be made to decide what "type" of hospital is to be built in any particular location until all the factors mentioned above have received proper consideration.* Failure to do this will inevitably prejudice the ultimate design and the result will be a hospital which has all the appearance of neatness and efficiency but which will in fact not be ideally suited to its task and may not be as economical to run as could have been possible with better planning.

As to the relation of the functional units in the hospital to each other, it is useful to prepare and to study "circulation diagrams." Study of these enables doctor and architect so to plan the layout that traffic along corridors between, say, each ward and other sections of the hospital shall not prejudice movements to and from other units, and so reduce waste of time by staff and patients going from department to department on their lawful occasions. The following diagram is an example of what is meant by a circulation diagram. A small diagram is given for each of the various departments discussed later in this paper, where it is felt that this would be helpful.

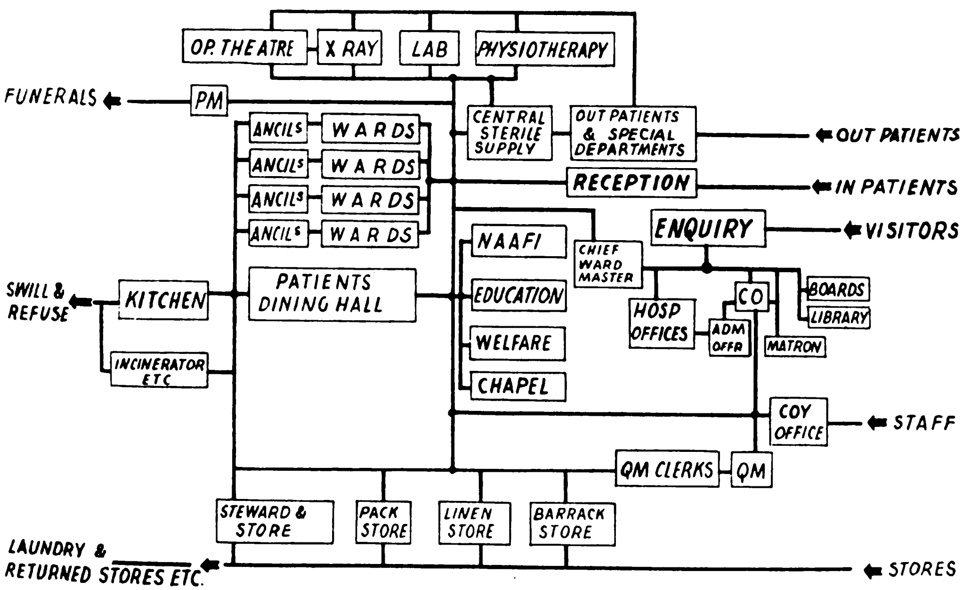

FIG. 1

DIAGRAMMATIC REPRESENTATION OF THE GENERAL CIRCULATION OF A MILITARY HOSPITAL.

(Unrelated to floor levels, aspect, or size and number of departments, wards, etc.)

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Having assessed the principal traffic streams between the various units, it is then necessary to decide the order of their relation to each other. Whether this relationship is to be vertical or horizontal is a question which should only be answered in the light of existing circumstances for each individual hospital project ; no general rule can be laid down.

The principal advantage of vertical planning is that traffic moves more easily up and down by lifts than it does by walking the length of wards and departments along one level. The disadvantages are that the installation of

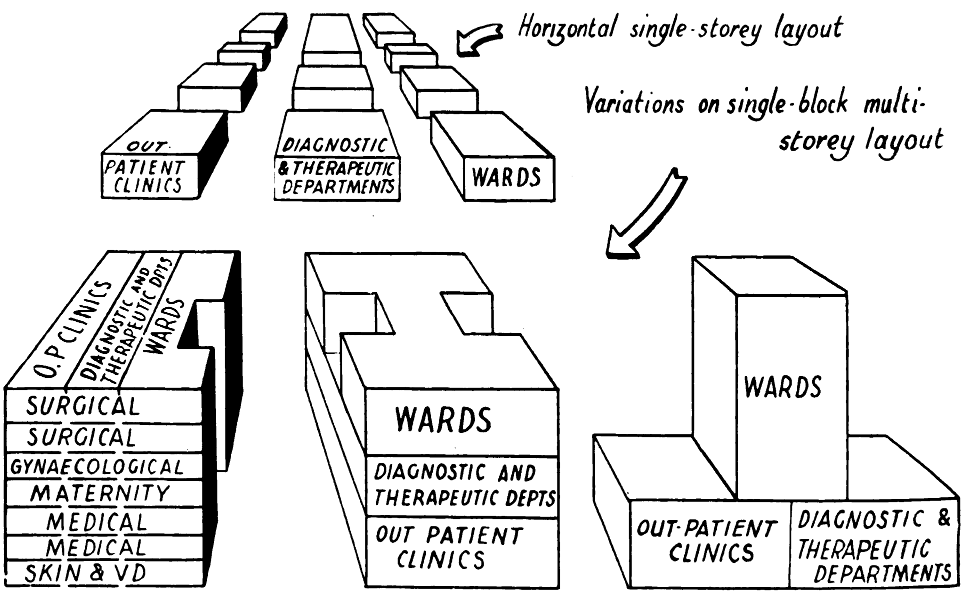

Fig. 2

The Relationship of Functional Elements of a Hospital.

(The basic *functional* elements are those indicated above. Elements such as administration, stores, services, catering, etc., will be located to fit into the basic relationships selected.)

drainage and other services up a number of storeys is comparatively expensive ; the superimposition of ward units demands a rigid uniformity in size of wards and layout of ancillaries that may hamper the efficiency of some departments ; it is necessary to provide fire escapes. The Ministry of Health's Departmental Committee on the Cost of Hospitals (1937) reported that vertical construction decreased costs up to about four storeys but thereafter increased them. It pointed out, however, that the over-all cost is not materially affected by the height of construction alone, but that numerous other factors have to be taken into account.

The advantages of horizontal planning are that there is no need to provide

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lifts and fire escapes; ground drains are cheaper to lay; there is no need for uniformity of wards or their ancillaries and each unit can be designed ideally to suit its own particular task without so much regard to its neighbours. The disadvantages are that it is often difficult to bring the various departments close enough together on a single floor for efficient working, and at the same time avoid traffic congestion round such "key" points as the X-ray department, laboratories, kitchen, etc.

Usually some compromise has to be adopted that will incorporate for any particular hospital as many advantages as possible of both systems while avoiding the major disadvantages of either. Fig. 2 indicates the basic compromises commonly adopted.

In carrying out all these studies it is important that an early distinction be made between what is essential and what is only desirable. For example, it is obviously essential for certain departments to be located on the ground floor (reception, main stores), but only desirable that others be so (out-patient departments); it is convenient for certain departments to be grouped together (X-ray department, surgical wards, operating theatres), but essential that others be kept apart (mortuary, wards, welfare departments, administrative offices). The factors operating are so numerous that it is beyond the scope of these notes to describe them in detail. Much must depend on the size of the hospital to be provided and no definite rules can be laid down. As a guide an analysis recently prepared for a specific 140-bed hospital is given at Appendix A, and this table gives an indication of the essential or desirable locations and grouping of the wards and departments.

Entrances and Exits

Entrances

The entrances to all hospitals demand particular care and consideration in planning. *The first impression received of a hospital is at the entrance, whether it be by in-patient, out-patient or visitor.* It is only natural that a layman's judgment of the technique of the medical treatment will be based on what he can see (and judge for himself) of the standard of comfort, good order and convenience that he finds. He cannot form any proper judgment of a hospital's standard of medical treatment because the technique is a mystery to him. He can, however, assess the efficiency of his reception and the cleanliness of his surroundings against standards he already holds, which are derived from his own home, his office or his unit. It is an important part of any treatment that a patient should have confidence in it from the beginning. It can readily be understood how his whole attitude to the treatment he is likely to receive may be prejudiced by depressing, badly lit and badly organized entrances.

The provision of separate entrances should be considered for the following categories:

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(*a*) Main entrance.
(*b*) Patients for admission to hospital.
(*c*) Out-patients.
(*d*) Staff.
(*e*) Stores.

Main Entrance

This is the principal entrance to the hospital at which all inquiries are dealt with and where visitors are sorted out and can be guided or dispatched to their proper destinations. It must be kept separate from the reception of patients. Accommodation at this entrance should be provided for the following :

Inquiry office and receptionist.
Telephones.

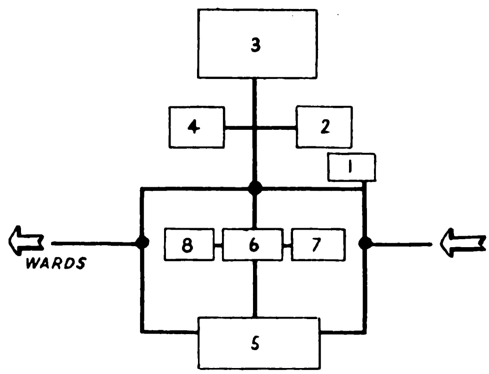

FIG. 3
RECEPTION.

1. Stretcher and Blanket Store.
2. Office.
3. Waiting.
4. Pack Issue Store.
5. Casualty Receiving Room.

6, 7 & 8. O.M.O.'s Duty Room, bedroom and bath.

Being the nerve centre of the hospital, it should have ready access to the following administrative departments or offices :

Hospital office, and A. & D. Office.
Commanding Officer, Matron and Administrative Officer.
Wardmasters.

It should be sited also to give reasonably easy access to the wards so that visitors to patients are not inconvenienced.

In-Patients' Entrance

(*a*) This comprises the reception department of the hospital, whose function is to control and record the admission of all in-patients. There should be

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provided some means of attending to stretcher cases or even a number of casualties, without interfering with the normal routine of admission of ordinary walking patients. For this purpose a separate "casualty" room is usually adequate.

(*b*) The following are regarded as meeting its essential needs :

(i) Entrance doors with ambulance shelter or portico.

(ii) Waiting room or hall with a separate room or a portion partitioned off for the supervisory and clerical staff.

(iii) Casualty reception room for reception of stretcher cases, etc.

(iv) Trolley bay.

(v) Pack issue store, for issue of the patient's hospital kit on admission. This can be provided as part of the reception office.

(vi) Stretcher and blanket store for replenishing ambulance cars.

(*c*) Accommodation should be provided in the vicinity for the orderly medical officer's duty room, bedroom and bathroom.

Out-Patients' Entrance

It is preferable for the out-patients' department to have a separate entrance from that for in-patients. This separate entrance should give on to a waiting hall which should serve all the out-patient departments, if possible. A supervisors' office and separate waiting rooms for officers and for families should be provided (or partitioned off). The detailed requirements of the out-patients' departments are dealt with later.

Other Ranks' Staff Entrance

This should be separate, if possible, from the other entrances and should also be the point at which the O.R. staff changing accommodation is provided. This latter is to enable the hospital staff to leave their ordinary clothes outside the wards or departments and put on their overalls or other working clothes. Washing and toilet accommodation should be provided at the same place.

Stores

A separate service entrance, for the food, equipment, laundry, fuel and medical stores, etc., must be provided.

Exits

(*a*) Goods, staff, patients and visitors should use the same door as that by which they entered.

(*b*) An exit for the convenient removal in privacy of the dead should not be overlooked. It should be unobtrusive, but accessible to casualty receiving room as well as to the wards (via lifts and corridors) and also to the road or pathway leading to the mortuary.

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APPENDIX A

(a)	Department (b)	Floor Required: Essential (c)	Floor Required: Desirable (d)	Linking: Essential (e)	Linking: Desirable (f)	Central or Peripheral (g)	Remarks (h)
1	Ward A (General Medical)	—	Upper			P with a C Link	
2	Ward B (Acute Medical and T.B.)	—	Upper			P with a C Link	South aspect preferred.
3	Ward C (V.D., Skin and Mental)	Ground		O.Ps.	Laboratory	P with C and O.P. Link	V.D. end entrance into O.Ps.
4	Ward D (Surgical)	—	Upper	Operating Suite	Central Sterile Supply Physiotherapy X-ray	P with C Link	
5	Officers' Ward	—	Upper	—	Theatres X-ray Physiotherapy	P with C Link	
6	Women and Children's Ward	—	First	—	Theatres X-ray O.Ps. Laboratory	P	Essential that Maternity Section be away at one end (peripheral end, not central end).
7	Dental Department		Ground or First	O.Ps.	X-ray	C with O.P. Link	
8	Operating Suite	—	—	Surgical Wards Women's Wards	X-ray Officers' Wards	P with C Link	
9	Central Sterile Supply	—	—	Theatres Autoclaves	—	C	
10	Pathology Laboratories	—	Ground or First	—	Medical and Surgical Wards O.Ps.	C	
11	Clinical Side Rooms	—	—	—	—	C	One per each floor containing main wards.
12	Mortuary	Ground	—	—	—	P	Outside hospital preferred.
13	Physiotherapy	—	Ground or First	Wards O.Ps.	X-ray	C	
14	X-ray Department	Ground	—	Surgical Wards O.Ps.	Medical Wards Reception	C	With a view to possible future expansion, should be so sited that additional rooms can be built on.

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(a)	Department (b)	Floor Required: Essential (c)	Floor Required: Desirable (d)	Linking: Essential (e)	Linking: Desirable (f)	Central or Peripheral (g)	Remarks (h)
15	*Out-patients' Departments:*						
	(a) Waiting Hall, Cafeteria and Treatment Room	Ground	—	Patients' Hospital Entrance O.P. Depts.	Reception Dispensary X-ray Dept. Physiotherapy	P with C Link	Treatment Room to link with Minor Operating Room.
	(b) Medical and Surgical Suites	Ground	—	Waiting Hall	X-ray Laboratory		
	(c) Minor Operating Room	Ground	—	Waiting Hall Treatment Room	X-ray		
	(d) E.N.T.	—	Ground or First	—	O.P. Waiting Hall	P with C Link	
	(e) Eye	—	Ground or First	—	O.P. Waiting Hall	P with C Link	
	(f) Gynæcology and Obstetrics	Ground	—	Gynæcology and Obstetric Wards O.P. Dept.	—	P with C Link	
	(g) Cafeteria, Toilets, etc.	—	—	—	—	—	See serial 15 (a).
16	Hospital Entrances	Ground	—	Administration Reception O.Ps. Q.M. Stores and Depts.	—	C	Separate entrance preferable for: (a) Patients linking to Reception, O.Ps. (b) Administration (Main Entrance) and Visitors. (c) Staff linking to Staff Locker Rooms, Q.M. Depts., Wards and Depts. (d) Stores linking to Q.M. Depts. and Kitchens.
17	Exits	Ground	—	Entrances Mortuary Q.M. Stores and Depts.	—	C P	Separate exits preferable for: (a) Patients—same as entrance. (b) Administration and Visitors—same as entrance. (c) Dead—to same side or end as the Mortuary. (d) Staff—same as entrance. (e) Stores—same as entrance or near to it—to give on to service road.

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(a)	Department (b)	Floor Required: Essential (c)	Floor Required: Desirable (d)	Linking: Essential (e)	Linking: Desirable (f)	Central or Peripheral (g)	Remarks (h)
18	Reception Office	Ground	—	Casualty Receiving Room Patients' Entrance O.M.O.'s Qrs.	—	C	
19	Telephone Exchange and Inquiry Office	Ground	—	Main Entrance	—	C	Can be combined with Wireless Control Room.
20	Wireless Control Room	—	—	—	R.S.M.	—	See serial 19.
21	O.M.O.'s Quarters	Ground	—	Reception Casualty Receiving Room	—	C	
22	Casualty Receiving Room	Ground	—	Reception Patients' Entrance O.M.O.s' Qrs.	X-ray Surgical Wards	C	
23	Pack Issue Store	Ground	—	Reception	—	C	
24	Staff Changing Rooms	—	One each floor	—	Staff Entrance or Staff Staircases	C	
25	Staff lavatories	—	One each floor	—	Staff Entrance or Staff Staircases	—	Provision for officers, sisters and O.Rs. (male).
26	Dispensary	Ground	—	O.Ps.	Wards Reception Main Entrance	C	
27	*Administration* (a) C.O.	Ground or First	—	Registrar	Chief Clerk Matron R.S.M.	P	
	(b) Registrar	Ground or First	—	C.O. Chief Clerk	R.S.M.	C	
	(c) Matron	Ground or First	—	—	C.O. Wards	P	
	(d) Q.M.	Ground	—	Q.M. Stores	—	P	
	(e) Hospital Office	Ground or First	—	Registrar	Reception R.S.M. Wards	C	

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(a)	Department (b)	Floor Required: Essential (c)	Floor Required: Desirable (d)	Linking: Essential (e)	Linking: Desirable (f)	Central or Peripheral (g)	Remarks (h)
	(f) A and D Department Office	Ground or First	—	Registrar Hospital Office	Reception R.S.M. Wards	C	Can be combined with Hospital Office.
	(g) Company Office	—	—	—	—	P	Preferably found in barrack area.
	(h) Pay Office	Ground or First	—	—	Hospital Office Main Entrance	C	
	(j) Post Office	Ground or First	—	—	Hospital Office Main Entrance	C	
	(k) R.S.M.	Ground	—	Main Entrance	C.O. Registrar	—	
	(l) Medical Board Room	Ground or First	—	—	C.O. Medical Officers' Library O.Ps.	P	
	(m) Medical Officers' Library	Ground or First	—	—	C.O. Medical Officers' Library O.Ps.	P	Can be linked with O.M.O.'s quarter.
28	Chapel, etc.	—	Upper Floor	—	Welfare Depts.	P	
29	Library and Reading Rooms	—	—	B.R.C.S. Accn.	Welfare and Education Area	P	
30	Diversional Therapy	—	—	—	Library and Education Area	C or P with C Link	
31	Welfare Officer	—	—	Library and Div. Therapy	—	P	
32	Education Area	—	—	—	Welfare Area	P with C Link	
33	Games Room	—	—	—	N.A.A.F.I. Canteen	P	
34	N.A.A F.I. Canteen	—	—	—	Welfare Area	P with C Link	
35	*Q.M. Department*						
	(a) Clerks' Office	Ground	—	Q.M. Office Q.M. Stores	—	C	
	(b) Pack and Kit Stores	Ground	—	Q.M. Office Q.M. Stores	—	P	Access to internal entrance to stores.
	(c) Linen Store	Ground	—	Q.M. Office Q.M. Stores	—	P	Access to outside yard and to inside.

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(*a*)	Department (*b*)	FLOOR REQUIRED Essential (*c*)	FLOOR REQUIRED Desirable (*d*)	LINKING Essential (*e*)	LINKING Desirable (*f*)	Central or Peripheral (*g*)	Remarks (*h*)
	(*d*) Barrack Store	Ground	—	Q.M. Office Q.M. Stores	—	P	Access to outside yard and to inside.
	(*e*) Reserve Medical Store	Ground	—	—	Q.M. Stores and Offices	P	Access to outside. Outside accommodation also for inflammable—and explosives.
	(*f*) Sanitation, Disinfectors, etc.	Ground	—	—	Q.M. Stores and Offices	—	Can be outside main building.
	(*g*) Oil and Fuel Store	Ground	—	—	Sanitation Store	P	Can alternatively be formed as part of barrack stores for issue to wards and departments.
	(*h*) Stewards' Office and Store	Ground	—	Q.M. Kitchen	—	P	Access to outside yard as well as to inside entrance to stores area.
36	Hospital Kitchen	—	Ground	Dining Hall Stewards' Stores	—	P with C Link	
37	Up-patients' Dining Hall and Servery	—	—	Kitchens	Wards	P or C with link to Kitchen	

[*To be continued.*]

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MEDICAL COVER

BY

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A DESCRIPTION of the measures adopted by the Army to provide medical cover for a military community under all conditions, in comparison with those envisaged by present-day social legislation for the civilian community in Britain.

INTRODUCTION

In this paper it is intended to make a comparison between the comprehensive medical service already in existence in the British Army and that now being provided under the National Health Service Act of 1946 for the civilian population of England and Wales.

Although dealing with two apparently entirely different communities, the essential objects of the two services are fundamentally the same—namely, to cure the sick, prevent disease, and maintain good health.

The National Health Service is composed of three divisions, linked together by an administrative structure, one providing hospital and specialist services, one health services, and the other general medical and dental services. For comparative purposes, the Army medical services can be divided up in a similar way, and it will be under these main headings that the matter will be discussed.

Before going any farther, a general comparison should be made between military and civil life.

The military community is largely male, necessarily of a high standard of physical fitness, with age range of 17 to 50 for the majority.

In addition, there are the families of the officers and soldiers, which are identical with civilian families in all respects, and other attached civilian personnel providing welfare and canteen facilities for the military community, who should be included as essential members of it.

The size of the military population is always accurately known. Its food supplies are controlled and constant. Its accommodation is maintained at a certain fixed standard, and its members are clothed and equipped in a uniform

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A DISSERTATION FOR THE DIPLOMA IN PUBLIC HEALTH (LONDON): Section 1, Introduction. Section 2, Comparison of Population Structures, Medical Manpower, Ratios, and Administration. Section 3, Hospital Services. Section 4, Health Services. Section 5, General Medical Services. Section 6, Summary and Conclusions.

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manner. Recreational amenities are provided in proportion to the size of the community. By the system of rationing of all essential items, every member of the community gets his fair share. There is no poverty or destitution.

Military stations change from time to time, and their population is constantly fluid, with the result that no person has any very deep roots in the soil anywhere. Local traditions and prejudices, such that exist, belong to the Army as a whole rather than to a particular place.

In general the Army is generously supplied with doctors and other medical personnel. Owing to the scattered nature of the Army population, however, this is a necessity. The role and status of an Army doctor are somewhat different from those of his civilian counterpart. By virtue of his officer status he is automatically given certain privileges and responsibilities, and he has powers of authority over his patients which do not exist in civil life.

The military community is highly disciplined, and discipline with regard to health maintenance is by no means neglected. The value of good discipline, in a community which has to adapt itself to live under all sorts of conditions, and to be prepared to fight when required to do so, cannot be over-estimated.

The above can hardly be said to apply to the civilian population of England and Wales. In the civil community, the age range is considerably wider and the age and sex structure of the population is entirely different from that of the Army.

In general, the distribution of doctors and other medical personnel is not so generous in proportion to the numbers to be served, and is by no means an even one.

The community cannot be said to be highly disciplined, and the doctor's powers of authority are not above those of any other citizen.

On the one hand, therefore, we have a small, controlled, healthy community, chiefly concentrated within certain age groups, with few women and children and practically no old people, the individual members having no roots in the soil.

On the other, we have a large comparatively uncontrolled population of all ages, unevenly distributed over the land, and, on account of its deep roots in the soil, being incapable of even redistribution.

The Army has been accustomed to an organized medical service for some considerable time, while the medical services of the civilian population are only just beginning to be co-ordinated.

However, both communities are susceptible to disease, accidents, and mental stress, and services must exist in both to deal with these matters both from the preventive and curative aspects.

It is not the intention of this paper to criticize unduly the methods of either of the two services, military or civilian, nor is it the intention to put forward any concrete suggestions for their improvement. It is hoped, however, that by discussing all the important and interesting aspects of each service it might be seen what sort of problems any organized medical service is likely to encounter, and how the one might benefit from the experiences of the other.

Above all, the Army medical services, like all other military organizations,

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must be elastic, and adaptable to all sorts of changes of circumstances. A high degree of mobility, both mental and physical, is required by all taking part therein. The civilian service is comparatively immobile. It can be planted and left to grow, adapting itself to its own particular surroundings, with no likelihood of its being rapidly uprooted and transplanted in foreign soil. Local autonomy therefore has much more right of place, and local tradition and influence can play their part with advantage.

This essential difference underlies all the comparisons that are about to be made.

Comparisons of Population Structures, Medical Manpower, Ratios and Administration

For comparative purposes, Table I shows the comparison by age and sex per thousand persons of a military and a civilian population. The figures shown are calculated from the strength of the total Army at mid-1948 and the civilian population of England and Wales on 31st December, 1947.

Table I.—Age/Sex Structure per 1,000 Population
Military and Civil
(Army families are not included.)

	Total Army (per 1,000)			England and Wales (per 1,000)		
Age	*Male*	*Female*	*Total*	*Male*	*Female*	*Total*
Under 15 ...	0	0	0	113	106	219
15	342	5	347	26	34	60
20	386	16	402	27	36	63
25	77	6	83	36	40	76
30	57	3	60	37	38	75
35	52	2	54	40	41	81
40	29	1	30	38	40	78
45 and over ...	23	1	24	155	193	348
Total ...	966	34	1,000	472	528	1,000

Table II shows a more detailed breakdown of the Army population into age groups of one year from 17½ to 33½, and in three age groups from 33½ to 45½, both for the total Army and the Army in U.K.

Table II.—Age and Sex Structure of the Total Army and the Army in U.K. at mid-1948
(Per 1,000 strength)

Age Group	*Total* *Males*	*Total* *Females*	*U.K.* *Males*	*U.K.* *Females*
Under 17½	7.6	—	12.2	—
17½—18½	65.1	1.5	107.3	2.6
18½—19½	269.1	3.4	288.1	5.7
19½—20½	220.0	5.2	175.4	8.0
20½—21½	77.3	4.5	59.4	5.9
21½—22½	43.6	3.3	35.8	4.4
22½—23½	24.4	2.0	21.9	2.6
23½—24½	20.5	1.5	19.1	2.0
24½—25½	19.2	1.3	17.8	1.8
25½—26½	16.4	1.2	15.6	1.5
26½—27½	14.4	1.4	13.6	1.7
27½—28½	14.9	1.3	13.8	1.6

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Age Group		Total		U.K.	
		Males	Females	Males	Females
28½—29½	... ...	12.6	0.7	11.9	0.9
29½—30½	... ...	11.1	0.7	10.5	0.9
30½—31½	... ...	10.2	0.5	9.8	0.6
31½—32½	... ...	11.7	0.6	11.2	0.7
32½—33½	... ...	12.1	0.5	11.4	0.6
33½—36½	... ...	35.2	1.2	33.8	1.5
36½—39½	... ...	28.7	0.9	29.3	1.1
39½—42½	... ...	18.5	0.7	19.1	0.9
42½—45½	... ...	10.9	0.5	11.2	0.6
Over 45½	... ...	22.6	0.9	25.3	1.1
		966.2	33.8	953.3	46.7
		1,000		1,000	

From the above tables it will be seen how greatly the two populations differ in composition. In the Army, over half the total population is concentrated between the ages of 17 and 23, while of the civilian population approximately one-fifth is under 15 and two-fifths are over 40. Also the sex ratio is entirely different for the two populations, the Army having an over-all ratio of 28.4 males to one female, while the corresponding civilian over-all ratio is 0.89 : 1, with a slight excess of males in the under-15 age group and a more marked excess of females among the over 45's.

As regards the ratio of families to the Army population, Table III shows the numbers of family personnel (divided into adults and children) in each overseas command to every 1,000 Army (including women's services) strength. The figures relate to mid 1948. The figures for the United Kingdom are not available.

TABLE III.—NUMBER OF FAMILY PERSONNEL PER 1,000 ARMY STRENGTH (INCLUDING WOMEN'S SERVICES) IN OVERSEAS COMMANDS

Command		*Adults*	*Children* (*under* 16)
B.A.O.R.	... ...	76	71
M.E.L.F.	... ...	41	40
FARELF	... ...	58	57
B.T.A.	... ...	107	72
BETFOR	... ...	61	44
Gibraltar	... ...	86	108
W. Africa	... ...	93	93

The medical manpower ratio varies considerably between the Army and the civil population. The over-all ratio in the Army is approximately 3½ doctors (including specialists, administrators, etc.) per 1,000 personnel. In the civil population of England and Wales it is approximately one doctor per thousand, taking all doctors into consideration. Table IV shows the ratio of different categories of doctor to the two populations, as far as is comparable.

TABLE IV.—DISTRIBUTION OF MEDICAL MANPOWER IN THE CIVIL AND MILITARY POPULATIONS, BY COMPARABLE CATEGORIES

Civil Population, England and Wales :

Consultants and Specialists	... ...	0.09 per 1,000 or 1 per 11,260
Full-time hospital employment	...	0.2 per 1,000 or 1 per 4,920
Health Service	... ...	0.05 per 1,000 or 1 per 20,000
General practice	... ...	0.43 per 1,000 or 1 per 2,380

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Army—Total:		
Consultants and Specialists	0.82 per 1,000	or 1 per 1,200
Hospital, general duty*	0.78 per 1,000	or 1 per 1,300
Army Health Specialists	0.13 per 1,000	or 1 per 7,700
M.Os. i/c troops	1.17 per 1,000	or 1 per 860

* Including trainee specialists

In United Kingdom:		
Consultants and Specialists	0.6 per 1,000	or 1 per 1,630
Hospital, general duty	0.6 per 1,000	or 1 per 1,630
Army Health Specialists	0.09 per 1,000	or 1 per 11,000
M.Os. i/c troops	0.93 per 1,000	or 1 per 1,000

In every case, the Army has a very much higher ratio of doctors to individuals than the civil population.

It is advisable at this stage to outline the general administrative structure of the Army Medical Service, and compare it as far as possible with that of the National Health Service of England and Wales.

At the head of the Army Medical Service is the Medical Directorate at the War Office, under the Director-General. It has numerous branches dealing with the different aspects of the service, Professional, Health, Nursing, Dental, and Administrative, which includes hospital planning, the organization of supplies, and the postings and appointments of medical personnel to meet all the Army's needs.

Below this, each Command or Force has its own Medical Headquarters, under the command of a Director or Deputy Director of Medical Services, also with its various branches.

Next come the Districts and Areas, or Corps and Divisions of an operational force, each with its own Medical H.Q. under the command of a senior medical administrative officer, the administrative chain finally branching off to supply the medical services of individual units or groups of units.

Thus, there is a single administrative chain, originating from the Medical Directorate at the top, which, as it descends, branches off to provide all the essential services required. There is one common control at the head, and all units communicate up the same direct line.

Consultants and Specialists are attached to this chain at certain levels. For example, each Command or Force has a consultant Physician, Surgeon, Psychiatrist and Pathologist working directly under the senior administrative medical officer, available to supervise and inspect the work of their particular speciality throughout the command. Specialists in Army Health, the military Medical Officers of Health, are found at all levels, in a position to advise on disease prevention and health promotion. A mobile laboratory service is attached to a Command or Force H.Q. for carrying out special investigations, and, in some areas where considered necessary, specially trained medical officers and special teams are provided to investigate and advise on certain diseases, such as malaria, that may be hampering the Army's activities.

Hospitals are also attached to this single chain, generally branching off at the Command, Corps or District level. The smaller hospitals or Reception Stations

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and the mobile field units branch off somewhere lower, at Area or Divisional level.

Decentralization is permitted to a considerable extent by delegating certain powers to the senior administrative medical officers at different levels, although it is impossible to allow complete autonomy.

Comparison of the above with the administrative structure of the National Health Service is not very easy. One can start by placing side by side the Ministry of Health, as the point of central control of the National Health Service, and the Medical Directorate of the War Office, and dividing the Ministry of Health's "command" into Hospital Regions for one purpose and into the areas of Local Health Authorities for its other purposes. The Regional Hospital Board might

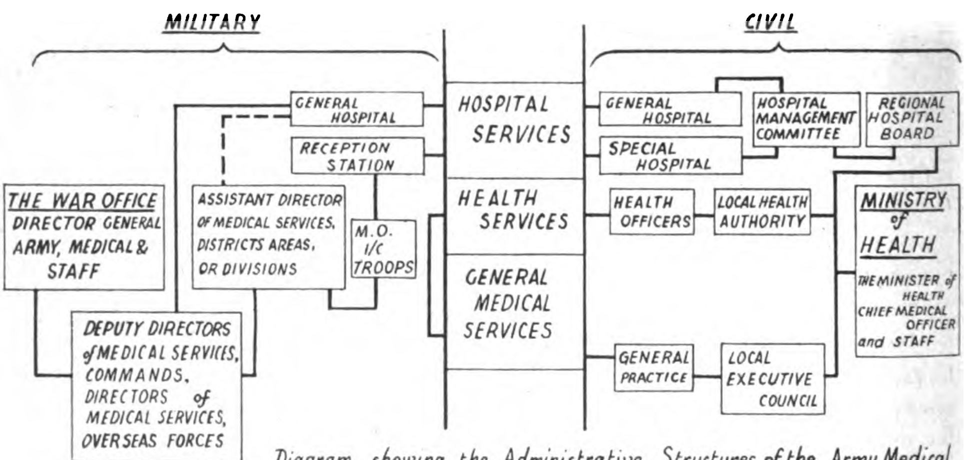

Diagram showing the Administrative Structures of the Army Medical Service and the National Health Service

be likened to the office of the D.D.M.S. of a Command which deals only with hospital services, the other services being divorced.

The Local Health Authorities are comparable with medical headquarters at lower levels, District or Area, which have thrown off the yoke of their D.D.M.S. and rendered themselves autonomous, maintaining, however, a somewhat attenuated line of communication with their highest authority, the Ministry of Health, down which flow advice and suggestions, rather than direct orders.

At this level we have two parallel branches, namely the Health Services under the Ministry of Health and the General Medical and Dental Services under the Local Executive Council. Although the work of these two branches is or should be closely interwoven under the new scheme, the doctors employed each have their own particular "Chief," to whom they are responsible, and the terms of employment in the two branches are fundamentally different.

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Along the administrative chain, at each level, a military headquarters Medical Staff undertakes responsibilities equivalent to those managed by a civilian Committee or Board at a similar level. Thus, the D.D.M.S. of a Command, together with his staff of perhaps five or six officers, undertakes duties similar to those of a Regional Hospital Board. He also forms another link between the Health Services and the General Medical Services and the higher command, this link having no counterpart in the administrative structure of the National Health Service.

The A.D.M.S. of an Area or Division combines the duties of Medical Officer of Health, Local Executive Council, and Hospital Management Committee. This may appear unduly autocratic, vesting too much power in one man. Such a system, however, is far more suited to military life, and enables rapid decisions to be made by one senior officer of experience, instead of having to wait for the decisions of a body of people who may be by no means unanimous.

Lay administration, which appears to be on the increase under the National Health Service Act, plays a very small part in the Army medical service, all the senior medical administrative posts being held by medically qualified persons.

[*To be continued.*]

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

From the Central Medical Laboratory, M.E.L.F.

II. CLASSIFICATION OF URINARY CARRIERS, AND THE DIAGNOSTIC VALUE OF URINARY ANTIBODY TESTS

BY

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ENTERIC carriers may excrete the organism in the fæces or urine. In general, fæcal excretion is commoner and more persistent than urinary (Vogelsang and Boe, 1948). In Egypt, however, various workers have emphasized the relative frequency and chronicity of urinary carriers (Ashton, 1947; Walton, 1949; Miller, 1950). Urinary schistosomiasis is common in Egypt, and its possible influence on the occurrence and persistence of urinary carriage requires further study. Urinary antibodies to the flagellar antigens of the enteric species carried were demonstrated in two Egyptian chronic urinary carriers with schistosomiasis (Archer, Bangham, Dunbar and Ritchie, 1950).

Egyptian food-handlers employed by the Army are examined before employment and annually thereafter for urinary carriage of enteric organisms. A number of carriers discovered during these routine examinations have been studied for periods up to seventeen months, in order to investigate the regularity and persistence of their excretion and to observe the numbers of organisms passed and the relationship of schistosomiasis to urinary carriage.

The presence and regularity of occurrence of antibodies in their urine has also been studied in order to assess the value of urinary antibody demonstration in the detection of urinary carriers.

MATERIAL AND METHODS

Individuals and Specimens Examined

Twenty-four urinary excretors of enteric group organisms were investigated. Of these 8 were passing *S. typhi*, 10 *S. paratyphi A*, 3 *S. paratyphi C* and 3 excreted both *S. typhi* and *S. paratyphi A*. Control material consisted of (1) a proportion of specimens submitted for routine culture from the native food-handler population which were also examined for schistosomiasis and urinary

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antibodies ; (2) further specimens obtained for detailed investigations from those persons who had provided antibody or ova containing specimens under (1). This latter series also served to demonstrate whether carriers might be detected by follow-up investigations when antibodies were present though initial cultures had been negative.

Culture Methods

Cultures were carried out by direct plating of a loop inoculum of the specimens on DCA, Litmus Lactose Agar, or McConkey (usually the latter) and by the use of selenite medium and fluid McConkey medium containing mannite as the fermentable "sugar" (Archer and Ritchie, 1950). Tetrathionate medium occasionally replaced selenite. Not less than two of these methods were used on the majority (about 70 per cent.) of specimens. In the later stages of this work all three methods were usually employed. Assessment of their relative value and consideration of the degree of association of enteric species with other organisms in urine will be made in a further paper in this series, as will considerations of virulence and of atypical cultural and serological reactions. Viable counts were carried out by surface inoculation of plates with drops of serially diluted urine.

Urinary Antibody Determinations

Urines were examined for the presence of "H" antibodies only, as preliminary tests on six urinary carriers showed that "H" antibodies were present to a higher titre than "O" antibodies, which were only detectable in one of the urines.

Centrifuged urine, undiluted for primary detection and serially diluted with saline for quantitative tests, was mixed with the bacterial suspensions in Dreyers tubes and incubated at 50—55° C. for two to three hours. A control consisting of equal volumes of urine and saline was used to exclude non-specific flocculation in the urine. Unagglutinated suspensions among the four used also served as controls. Results were read either immediately or overnight. Mere clearing of the suspension overnight without a demonstrably *floccular* deposit was ignored.

Schistosomiasis

Microscopic examinations of the deposit from the specimen (generally about 4 ml.) centrifuged for the antibody test was carried out.

PART ONE

CLASSIFICATION OF CARRIERS

The results of the examinations carried out on the excretors of *S. typhi*, *S. paratyphi A*, *S. paratyphi C* and both *S. typhi* and *S. paratyphi A* are presented in Tables I—IV respectively.

Double Carriers.—Infection with *S. typhi* and *S. paratyphi A* was concurrent in these cases as shown below.

Excretor No. 3.—The interval between the second isolation of *S. paratyphi A* and the isolation of *S. typhi* was only 5 days. *S. paratyphi A* was again isolated 18 days later after seven negative cultures. *S. typhi* was passed 5 days later.

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Excretor No. 14.—Both species were isolated from a single specimen by different means. Each was subsequently isolated separately at 6 days' interval.

Excretor No. 28.—*S. typhi* and *S. paratyphi A* were separately isolated within a week. Both were found on the same plate from a later specimen.

TABLE I.—S. TYPHI EXCRETORS

Ref No.	Observed duration in months	Urine Cultures +/No. of exams	= % +	Homologous Urinary 'H' Antibodies (U.A.Bs.) +/No. of exams	= % +	Highest Homologous U.A.B. Titre	Highest Homologous 'H' Serum Titre	Schistosome Ova +/No. of exams
1	9	56/63	89	17/27	63	1/10	1/500	6/23
2	5	19/29	66	17/29	59	1/20*	1/50	7/23
4	5	26/27	96	16/25	64	1/20*	1/500 tr	0/24†
10	14	43/47 (*a*)	91	18/24	75	1/20*	1/250	14/35 (*a*)
13	1	11/11	100	8/11	73	1/4		0/8
17	½	5/5		5/5		1/20*		4/5
20	16	56/56	100	6/6		1/5	1/2500	13/13
22	8	11/11	100	1/1		1/25	1/500	0/12

* Not tested to higher titre. † W.B.C. and R.B.C. noted.

Note (*a*) This case underwent treatment for schistosomiasis elsewhere. Before this treatment schistosome ova were present on 11/13 examinations. He was later treated with urinary antiseptics without permanent benefit. Cultures during and between courses of treatment are omitted from the culture examinations recorded in column 3.

TABLE II.—S. PARATYPHI A EXCRETORS

Ref No.	Observed duration in months	Urine Cultures +/No. of exams	= % +	Homologous Urinary 'H' Antibodies (U.A.Bs.) +/No. of exams	= % +	Highest Homologous U.A.B. Titre	Highest Homologous 'H' Serum Titre	Schistosome Ova +/No. of exams
5	12	32/36	89	13/19	68	1/64	1/100	5/20
7	1	2/2		1/1		1/25	1/500 tr	0/1
9	13	70/73	96	15/23	65	1/32	1/250	22/32
11	17	4/27	15	2/22 (*a*)	9	1/2	<1/25	11/23
12	14	54/81	67	9/17	50	1/12.5	1/250	7/28
18	1½	16/16	100	10/10	100	1/20*	1/2500	4/5
19	16	43/43	100	10/11	91	1/4	1/250	10/13
21	12	26/26	100	1/1		1/25	1/250	8/8
25	3½	1/8		0/1				0/7
27	1	1/2		1/1		1/4*		0/1

* Not tested to higher titre.

Note (*a*) On four other occasions *heterologous* antibodies were present. (These have been included in *Fig. I* since, although not in fact specifically significant, their presence would be taken as an indication of potential danger.)

Persistence.—Among the individuals listed two *S. typhi* excretors, five excretors of *S. paratyphi A*, and one person passing both these species were under observation for 12 months or more. Excretion for this period constitutes chronic carriage as usually defined. Four *S. typhi*, one double *S. typhi* and *S. paratyphi A*, and two *S. paratyphi C* excretors were observed for 5-10 months. An estimate of the likelihood of chronicity could therefore be attempted in these cases.

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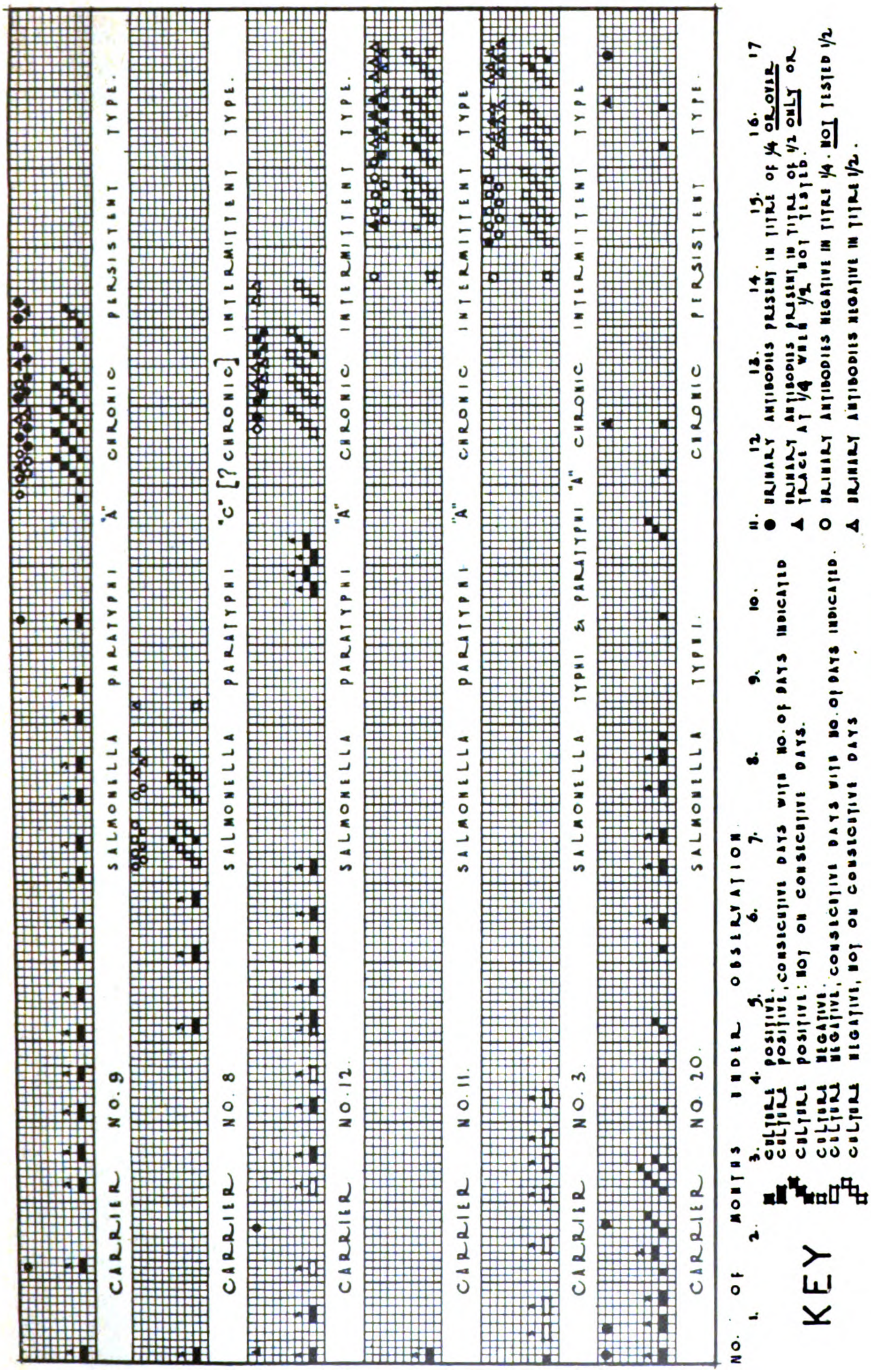

Fig. 1.—Excretion of Organisms and Antibodies by Intermittent Carriers

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Chronic carriage could not be assumed in respect of persistent excretors among the remainder, though *paratyphi C* excretor 24 and *paratyphi A* excretor 25, each of whom yielded only one positive culture, may probably be assessed as *transient* carriers.

TABLE III.—S. PARATYPHI C EXCRETORS

Ref No.	Observed duration in months	Urine Cultures +/No. of exams	= % +	Homologous Urinary 'H' Antibodies (U.A.Bs.) +/No. of exams	= % +	Highest Homologous U.A.B. Titre	Highest Homologous 'H' Serum Titre	Schisto-some Ova +/No. of exams
8	10	14/27	52	0/13	0		<1/25	3/17
23	10	1/17	6	0/1			<1/25	0/17
24	2	1/5						0/5

TABLE IV.—DOUBLE EXCRETORS OF S. TYPHI AND S. PARATYPHI A

Ref No.	Observed duration in months	Urine Cultures +/No. of exams	= % +	Homologous Urinary 'H' Antibodies (U.A.Bs.) +/No. of exams	= % +	Highest Homologous U.A.B. Titre	Highest Homologous 'H' Serum Titre	Schisto-some Ova +/No. of exams
3	17	4/58 (3A, 1T)	7	2/27 (Antigen *a*) 0/27 (Antigen *d*)	7 (Anti-gen *a*)	1/4	1/150 (Antigen *a*) 1/100 (Antigen *d*)	6/31
14	6	6/6 (*i*) (1T)		0/4				1/4
28	A few days	2/3 (1A, 1T)		0/1				

Note (*i*) This man remained under investigation. He ceased to pass either species of organism and no salmonellæ were isolated on daily examination for 10 weeks. Scanty *S. paratyphi A* were then isolated from fluid culture (McConkey Mannite) on one occasion, and *S. typhi* six days later. Urinary antibodies to antigens *a* and *d* were present on 5/41 and 7/39 tests respectively.

The cases tabulated thus fall into the following groups :

1. *Chronic Persistent Carriers*

(*a*) *S. typhi* excretors No. 10 and No. 20 and *S. paratyphi A* excretors Nos. 5, 9, 19 and 21 with 89 to 100 per cent. positive isolations from 26-73 specimens over an average of 14 months are classified as *chronic persistent carriers*.

(*b*) Three other excretors of *S. typhi* can probably be regarded as chronic persistent carriers. These are No. 1 with 89 per cent. positive of 63 cultures during 9 months' observation (see also Note (*a*) to Table V), No. 4 with 96 per cent. positive of 27 cultures during 5 months' observation, and No. 22, from whom all 11 cultures taken during 8 months were positive.

(*c*) The following individuals with a high positive culture incidence remain to be assessed : Typhoid excretor No. 2 with 66 per cent. of 29 cultures positive

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during 5 months' observation ; Paratyphoid A excretor No. 12 with 67 per cent. of 81 cultures positive during 14 months' observation ; Paratyphoid C excretor No. 8 with 52 per cent. of 27 cultures positive during 10 months' observation ; and Mixed excretor No. 14. The first three, from whom the proportion of positive cultures was lower than was found in the nine considered under (*a*) and (*b*) above, might be either (i) Persistent carriers showing frequent failures of isolation more or less uniformly distributed among successful cultures (this might be due to either the passage of small numbers only or to a reduced viability of the organisms passed ; such reduced viability might be due to the coincidence of Phage) ; (ii) cases of intermittent carriage where successive negative cultures occurred over a period followed by single or successive positive ones ; (iii) examples of transient carriage of moderate duration. With regard to excretor No. 2, though there was a six weeks' period after primary isolation when three cultures within 14 days were negative, there was reason to consider this a false rather than a true intermission (see below and note (*c*) to Table V), and later periodicity indicated that he was a *persistent* carrier.

The periodicity of positive cultures similarly showed that *S. paratyphi A* excretor 12 and *S. paratyphi C* excretor 8 are *intermittent* carriers, No. 12 being *chronic*, while the chronicity of No. 8 remained unestablished at the end of these observations.

The last of these four (carrier 14) was originally difficult to assess since few cultures were made within the period covered by these investigations and there was an interval of 3 months between the first and the five later cultures. As recorded in note (*a*) to Table IV, however, later observations indicate that he is an intermittent carrier with long periods of freedom from excretion.

2. *Chronic Intermittent Carriers*

The intermittent finding of enteric group organisms of the same species in a series of urine cultures may indicate intermittent carriage or a series of episodes of transient carriage following reinfection. Walton (1949) quotes three cases requiring such differentiation since they were associated with a persistent excretor of the same species (*S. paratyphi C*). Even where no such definite association is known, the persistent carrier rate and double infection rate suggest that there is a high degree of exposure to the risk of reinfection among these people. It is thus impossible to *prove* intermission following a single infection unless the persons under investigation can be removed to an environment free from this risk. Such segregation was not practicable in the cases we studied. Nevertheless the probability of intermission rather than repeated reinfection increases with each fresh incidence of a positive culture (or series of positive cultures), and intermission is also more likely if the negative-culture intervals between such incidents are of very short duration. On grounds to be detailed later, therefore, under "Culture," *S. paratyphi A* excretor No. 12 (as stated above) and the double excretor of *S. paratyphi A* and *S. typhi* No. 3 were assessed as *chronic intermittent carriers*. *S. paratyphi A* excretor No. 11 may also be such (and has been so shown in Fig. 1) or he may have been reinfected.

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3. *Transient Carriers*

S. paratyphi C excretor No. 23, with only one positive culture during 10 months, is presumed to be a *transient* carrier in addition to those already mentioned as probably such.

4. *Unclassified*

Nos. 7, 13, 17, 18, 27 and 28 must remain unclassified on the data presented. They are only included in the record of this investigation for the evidence they provide regarding double infection, urinary antibodies, schistosomiasis, etc. Observations made subsequent to those here recorded, however, showed *S. typhi* excretor No. 13 to be still passing this species regularly after a further 5 months.

Chronic Persistent Carriers

In accordance with the above summary six carriers are definitely, and four provisionally, classified as chronic persistent carriers. They are grouped together on Table V, in which additional information regarding them is given. One of those provisionally classified was confirmed by observations after the original work had been brought to a close (see Note (*a*) to table V).

Incidence of Negative Cultures within this Group

Gaps in the series of positive isolations by direct plating occurred twenty-seven times. Two consecutive negatives occurred six times (twice, once and three times in respect of carriers No. 1, No. 2 and No. 9). Three such failures of isolation occurred once (carrier No. 10).

First isolation from carrier No. 19 was made from a culture in selenite. Direct plating of a loopful from the pool of three specimens used was negative. This represents another three-day intermission by the latter method.

The use of additional methods of culture reduced the number of intermissions to 19, with two consecutive negatives once (carrier No. 2) and three consecutive negatives three times (carriers No. 1, No. 2 and No. 10). The period of time over which these consecutive negative cultures (by all methods used) extended was 3, 3, 5, and 14 days, and the interval between positive cultures in the first three of these instances 7, 7 and 10 days. The 14-day negative period occurred with carrier No. 2 as mentioned above. In this instance two of the three cultures were by the selenite method only. This method commonly failed with this strain even when direct cultures were positive. These three negatives formed a small isolated series of cultures commencing three weeks after primary isolation. A positive culture was obtained a week after the last negative.

Intermission in the Occurrence of Demonstrable Urinary Antibodies within this Group

Failure to reach a titre of 1/4 occurred intermittently 35 times in 166 tests. The longest series of consecutive negatives was eight (once, in carrier No. 2). There were also six failures (once, in carrier No. 9), five (twice, in carriers No. 1 and No. 10), four (once, in carrier No. 4), three (seven times ; carriers No. 1,

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TABLE V.—CHRONIC PERSISTENT CARRIERS

Ref No.	Species carried	Observed duration (months)	Schistosomiasis	Urine Culture % +	Phage type of Organism (UT = untypable)	Viable Organisms per ml.		Urinary Antibodies (Test series using 1/2 as lowest dilution) (*d*)			Highest Serum Vi Titre
						No. of exams	Range of counts	Homologous		Heterologous % (*ratio* if No. of exams < 10)	
								+/total	%		
1	T	9 (*a*)	+	89	UT	2	20,000 23,000	12/16	75	0	1/200
2	T	5	+	66	UT	(*c*) 3	1,500,000 20,000,000	11/16	69	19	1/50
4	T	5	(*b*)? −	96	UT	3	50,000 1,000,000	7/10	70	40	
5	A	12	+	89		1	68,000	8/9		0/9	
9	A	13	+	96		2	700 1,700,000	12/14	86	0	
10	T	14	+	91	UT	2	5,000 160,000	16/16	100	6	1/160
19	A	16	+	100		5	1,000 50,000	10/11	91	0	
20	T	16	+	100	A	9	7,000,000 30,000,000	6/6		1/4	1/80
21	A	12	+	100		4	21,000 2,000,000	1/1		0/1	
22	T	8	−	100	A	2	2,000,000 9,000,000	1/1		0/1	1/160
Totals or Averages				93				84/100	84	9	

Note (*a*) The provisional classification of *S. typhi* excretor No. 1 as a chronic persistent carrier was *confirmed* by regular positive cultures 5 months after the observation recorded above.

(*b*) No ova seen on 24 examinations, but R.B.Cs. and W.B.Cs. seen indicated a pathological condition of the urinary tract.

(*c*) Two other viable counts ended abruptly at 1/100 dilution. This, and a frequent failure of growth in fluid media from specimens positive on direct plating, suggested self-sterilization, possible by phage action.

(*d*) The ratios and percentages of positive tests is higher in this table than in Tables I and II since, to indicate optimal results, only tests commencing with 1/2 dilution are here included—see also under "Urinary Antibodies" and Table X (Part Two).

No. 2 and No. 5 twice each, and carrier No. 4) and two failures (five times; carriers No. 1, No. 5, No. 9, No. 10 and No. 19).

Failure to reach a titre of 1/2 produced only ten periods of intermission in the 100 tests performed. The longest series of such negative test was three, which was found once only (carrier No. 4). Two consecutive negative tests occurred four times (carriers No. 1, No. 9 and No. 2 (twice)).

Vi Serum Titre

Five of the six carriers of *S. typhi* were examined for Vi serum titre. All showed the presence of Vi antibodies. Titres ranged from 1/50 to 1/200.

[*To be continued.*]

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HEALTH IN THE ARMY

BY

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A DISSERTATION SUBMITTED FOR THE DIPLOMA IN PUBLIC HEALTH

Introduction

The object of this dissertation is to give an account of the Health Service of the British Army at the present time. Much has previously been written about most of the factors concerned; this attempt is now made to correlate these components so as to present under one cover a systematic survey of the whole.

The basic functions of any Health Scheme, Service or civilian, are :

1. Promotion of health.
2. Prevention of disease.
3. Medical care.

As, however, it would be manifestly impossible in the limited space allowed to treat of every relevant consideration in equal detail, the main emphasis is placed on the promotion of "positive" health with its problems peculiar to the requirements of the Armed Forces. Preventive measures and medical care of the sick, which on the whole differ little from civilian practice, are mentioned briefly for the sake of completeness. Furthermore, special problems of major wars—for example, of accommodation, rations, water, etc.—are not included, as they are considered to be outside the scope of this paper, which is primarily concerned with the Army in the pursuit of its normal peace-time duties.

Historical

Before 1660 there was no Standing Army; forces were raised and equipped as required. As a rule, although some senior officers had their private medical attendants, there was no machinery for dealing with sick and wounded; they were merely discharged from the Army when unfit to fight, in whatever part of the world they might happen to be. In most cases these unfortunates were not even brought home to England before discharge, but left to their own devices [1]. Arrangements were occasionally made for their transport—Edward III, for example, had the sick and wounded brought back to England in 1346, and in 1563 those from the Siege of Havre were accommodated at the port of disembarkation (Portsmouth) until fit to travel to their homes but not until 1600 was any regular provision made for their care. In that year military hospitals were authorized

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and established at Dublin and Lough Foyle—from motives, it may be noted, not humanitarian but economical, brought about by the large wastage from sickness of troops sent to Ireland [2]. When the Standing Army was formed in 1660, each Regiment was provided with its own hospital with a Medical Officer, Hospital Serjeant and Hospital Orderlies, but there was no ordered plan for the evacuation of sick and wounded [3]. Nevertheless, this was certainly a most progressive development, particularly when the comparable arrangements, or lack thereof, for the civilian population of England at that time are considered.

No further developments can be recorded for nearly two centuries, when, on the outbreak of the Crimean War in 1854, a Hospital Conveyance Corps was formed. This soon proved a failure because it was recruited from unemployed pensioners who were old and feeble, and in 1855 the first Medical Staff Corps was formed at Chatham, wherein brief training was given for hospital and general duties. This Corps was also unsuccessful, largely because it had no officers of its own, and was followed in 1857 by the Army Hospital Corps, a new feature of which was its subdivision into Medical Staff, consisting of Medical Officers who had no disciplinary powers, and General Staff seconded from regiments [4]. But the administration of the Corps was not entrusted to its own officers, and hence its proper development was retarded until 1873, when the regimental system was abolished.

So far the main efforts of the Army Medical Service had been directed to the third of the functions enumerated above, that is, medical care of the sick. Although all the great military leaders of history, even back to the time of Moses, had realized that losses of men in war from sickness far exceed battle casualties, and many of them had striven hard, and often successfully, to prevent and control such outbreaks, they had been gravely handicapped by the universal lack of scientific knowledge. The Industrial Revolution stimulated the advancement of such knowledge, and the Public Health Act of 1848 provided for the appointment of Medical Officers of Health. The Army soon followed suit by appointing in 1860 Edmund Parkes the first Professor of Hygiene at the newly opened Army Medical School at Chatham. Parkes wrote the first Manual of Military Hygiene. He campaigned for the health education of all who had control of feeding, clothing and housing, and made great efforts for the improvement of the soldier's living conditions, so successfully that when he died in 1876, Baron Mundy, Professor of Military Hygiene at the University of Vienna, said : "All the Armies of the Continent should at parade lower their standards craped, if only for a moment, because the founder and best teacher of military hygiene of our day, the friend and benefactor of every soldier, Edmund Parkes, is no more" [5].

Even so, by the time of the South African War there was still no knowledge of preventive measures by any but medical personnel, and little co-ordination between the medical and combatant branches of the Service. The appalling enteric fever incidence of 100 per 1,000 per annum during the campaign bears witness of this, and the incidence of other preventible diseases was proportionately high, owing to absence of water purification facilities, poor standards of shelter, inadequate field ablution, bathing and laundering arrangements,

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unsatisfactory disposal of waste matters, absence of methods of dealing with flies and insects, lack of disinfestation facilities and poor feeding. A Royal Commission on the work of the Medical Services in the South African War was held, as a result of which the young Royal Army Medical Corps, formed in 1898, was charged with the teaching of sanitation and hygiene throughout the Army.

A start was made by publishing in 1905 an Army Manual of Sanitation for non-medical readers, and in the following year a School of Sanitation was founded at Aldershot to train regimental officers and non-commissioned officers in sanitation and water duties. In 1908 sanitation was made a compulsory subject in the examination for promotion to Captain of all regimental officers [6]—a measure which has been reintroduced in 1950, after being in abeyance for many years.

Hence by 1914 the principles of sanitation had been taught to the Regular Army, some equipment for water purification and field sanitation had been developed, and improvements had taken place in accommodation, clothing and diet. During the 1914-18 war all officers were trained in preventive measures, passing on the instruction to their men. Notable advances in preventive medicine were made, of which just one illustration may be mentioned here, namely, the dramatic fall in the incidence of enteric fever following the introduction of mass inoculation and attention to hygienic principles.

After the Great War, when the Army Hygiene Service was completely reorganized, Sir William Horrocks was appointed the first Director of Hygiene in 1919. This organization, substantially unchanged save for the substitution of the title "Army Health" in keeping with modern conceptions, has withstood well the many stresses of the 1939-45 war, and continues today its unceasing task of promoting and maintaining the health of the soldier—the emphasis, be it noted, having shifted once again, this time from mere prevention of disease to the more positive aim of the promotion of health.

No historical survey, however brief, of the development of Army Health could be regarded as in any way complete without reference to the growth of socio-medical facilities for the soldier's family, which have frequently been in advance of contemporary civilian practice. Thus as far back as 1767 a schoolmaster was appointed by the Queen's Royal Regiment, and in 1811 every regiment was ordered to start a school for its soldiers' children [7]. In 1892 Nursery Schools for three-year-olds were provided. Some ten years later systematic school medical inspections were instituted, followed in 1907 by the issue of milk to schoolchildren and shortly afterwards by provision of dental care.

Military families were not officially recognized before 1800, and responsibility for them was not accepted by the Army Medical Service until 1878 [8]. Nevertheless, by 1863 female hospitals had been established at home and in India at the instigation of Florence Nightingale, while in 1873 Married Quarters Rolls were compiled, sanitary inspections of married quarters were being carried out, and instruction was being given to "soldiers' wives desirous of becoming midwives and qualifying as Army Midwives and Sick Nurses" [9]—the beginning of

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a Maternity and Child Welfare Service. Maternity and Child Welfare Schemes, supported by voluntary contribution and effort, were well advanced by 1921, supplementing ante- and post-natal clinics at Military Families' Hospitals. Official sanction was given to them in 1924, together with financial grants and equipment, and at the present day such centres are in operation at all home and overseas military stations where families are quartered.

Promotion of Health

Definition

Positive health has been defined as "attunement to surroundings, combining with vigour, balance and efficiency, and with the adequate co-ordination of mental and physical function to produce a harmonious integration with environment, confidence and satisfaction in work, recreation and leisure, and a capacity for effectiveness of essential relaxation and rest" [10].

The first necessity for the attainment of this object is obviously to select sound, or at least potentially sound, material for the Army from the population at large. The second is to attempt to mould this material to the desired pattern by attention to health education and environmental details. These postulates will now be discussed under the headings of Recruiting Procedure and Personal Hygiene.

Recruiting Procedure

It is an accepted fact that the physical and mental health of an individual are interdependent, and that either or both may be affected for better or for worse by his occupation. His suitability for a particular occupation depends in turn on his physical qualities—general physique, manual dexterity and ability, and mechanical aptitude—and his mental qualities—general intelligence, mental capacity, temperament and educational attainments. The modern Army is a complex organization which employs its men in a great variety of trades or occupations; it is, therefore, important to post each man to a trade suited to his qualities in order to obtain the best results from the individual and hence maximum efficiency of the Service as a whole. It is, perhaps, surprising that not until 1942 was any serious attempt made in the British Army at scientific selection of personnel; true, there was a wide range of medical categories, but these were based only on physical attributes, no account being taken of mental qualities other than gross psychiatric disorder. Since then a quite elaborate procedure for personnel selection has been developed in the attempt to discover individual ability from the physical and psychological aspects.

Having been passed fit for service by a civilian Medical Board, the recruit is in due course called up to a Selection Unit, where he spends fourteen days, devoted to medical classification, personnel selection procedure, issue of kit and a minimum amount of introductory training.

(*a*) Personnel Selection

Personnel Selection is carried out by specially trained staff. Although non-medical, their work is of considerable medical importance as it is they who assign

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each recruit to his future Army trade. Close co-operation between the medical and personnel selection staffs is essential if successful results are to be obtained; some account of their work will, therefore, be given.

Selection procedure consists of three phases: the application of tests, recording of personal history and an interview. The tests are devised to obtain information about a man's abilities in various directions, and to enable easy and reliable comparisons to be made between different men's capacities. Those used are the Dominoes (replacing the Matrix) Test of general intelligence; the Problems Test of mechanical aptitude; an Arithmetic Test to measure the standard reached in simple mathematics; a Verbal Test of ability to understand and use words; the Instructions Test to determine ability to understand complex instructions and to carry them out rapidly and accurately; and finally the Assembly Test of manual dexterity and ability to see how parts fit together to form a simple mechanism. The results are given in groups which correspond to the proportions of men in the Army as follows:

Selection Group 1	Top 10 per cent.
Selection Group 2	Next 20 per cent. below group 1.
Selection Group 3+	The 20 per cent. just above average.
Selection Group 3−	The 20 per cent. just below average.
Selection Group 4	Next 20 per cent. above group 5.
Selection Group 5	Bottom 10 per cent.

A Summed Selection Group is calculated for each man from the combination of the groups allotted on all except the Assembly Test.

Personal history, including nationality, education, civilian employment record and hobbies, linguistic knowledge, driving experience and service in youth organizations such as the Cadet Forces, is recorded on a four-page Qualification Form by the man at his pre-service medical board. He may also express a preference for a particular Corps. At the Selection Unit the Personnel Selection Officer records on the same form the results of the tests, the man's educational standard in code form, his Combat Temperament, Employment Record, Leadership Potentiality, and whether or not he is a potential officer or non-commissioned officer. His medical classification is also shown on the form.

The man's test results and statement are before the Selection Officer during the interview, which lasts for about twenty minutes. In this time the officer must elicit the answers to six questions [11]—namely:

(i) What are his physical capabilities?
The answer to this is given in his PULHEEMS assessment.

(ii) What does he know already that is useful to the Army?
The Qualification Form will provide the details.

(iii) How much and how quickly will he learn?
The Selection Test results will form a useful guide.

(iv) Has he any special "gifts" which will be useful to the Army?

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(v) Is there anything about his personality which will affect his utility in the Army ?

(vi) In what is he interested ?

After interview, the Selection Officer writes a brief opinion of the man and finally makes three employment recommendations. Three recommendations are made because, owing to differences between supply and demand, the ideal choice obviously cannot be made in every case.

For each employment a series of minimum test levels has been laid down, below which experience shows that a man is unlikely to be successful. It is not claimed that tests will always pick a man for a particular trade, and in any case previous experience must be taken into consideration, but they should serve to eliminate men who will never learn it, or who will learn with such difficulty that it is hardly worth while spending the time and trouble on them.

(*b*) MEDICAL CLASSIFICATION

On the outbreak of war in 1914 volunteers for the Army were examined for fitness to serve by general practitioners. Naturally enough the results were diverse, as one practitioner's opinion of fitness might vary considerably from another's. In the following year Standing and Travelling Medical Boards were introduced to classify volunteers into four categories of fitness or unfitness for service at home and abroad, and examination by civilian practitioners was abolished. Following the Military Service Act of 1916 the Ministry of National Service took over recruiting for the Army and Air Force ; men were placed in one of four numbered grades at medical boards, and transferred to corresponding military categories on joining the Army. This was the basis of the method adopted in 1939-1945. In February, 1940, Army categories were increased and further subdivided for better utilization of manpower, and categories were laid down in detail for the various Arms. This was an improvement, but the great disadvantage remained that no account was taken of emotional and mental make-up and little information was given of the type of man.

The essential requirements of a system of medical classification for occupation are a detailed qualitative estimation of the individual together with a qualitative analysis of employment requirements, expressed in the same terms [12]. A decisive step in this direction was the development of the PULHEMS system by the Canadian Army during the late war. With some alteration of detail this classification was first introduced into the British Army in 1944 under the name PULHEEMS. During the change-over period the new and old systems were used side by side until on 1st April, 1948, the old classification was entirely superseded by PULHEEMS, which is now applicable, with suitable modifications, to all three Armed Forces.

General Principles of PULHEEMS System [13]

The objects of the system are :

(i) To provide a functional assessment of the individual's capacity for work.

(ii) To assist in expressing the physical and mental attributes appropriate to individual trades and employments within the Service.

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(iii) To assist in posting men to the employment for which they are most suited in the light of physical, intellectual and emotional make-up, and thus to economise in manpower.

(iv) To provide a system which is administratively simple to apply in peace and war.

The name is derived from the first letters of the subdivisions of bodily and mental functions, known as Qualities. These are :

P—Physical Capacity. Expressive of general physical characteristics and potential capacity to develop physical stamina with training.

U—Upper Limbs. Assesses the functional use of the hands, arms, shoulder girdle and upper spine, and in general shows ability to handle weapons. Pathological conditions of the upper limb having a constitutional basis may also affect the "P" assessment.

L—Locomotion. Ability to march. Pathological conditions affecting marching ability which have a constitutional basis also affect the "P" assessment.

H—Hearing. Ability to hear ; diseases of the ear are recorded separately under "P."

EE—Eyesight. Ability to see with the right and left eyes respectively. Diseases of the eyes are assessed under "P."

M—Mental Capacity. Based on ability to learn Army duties, assessed from the impression made on personal interview, with particular regard to alertness and ability to apply usefully the intelligence possessed, from the record of school and occupational progress, and from selection test results, particularly tests of intelligence and acquired ability.

S—Emotional Stability.

It will be noted that the emphasis is on function in all cases, not on anatomical perfection, which represents a further advantage over previous systems.

Degrees of Assessment

The standard of fitness under each quality is assessed in degrees and recorded by figures 1 to 8, though not all of the figures are used in every quality. Thus :

P—Is expressed by 1 to 8.

U, L, H—By 1, 2, 3, 7 and 8.

EE. Visual acuity is expressed by figures 1 to 8 for simplicity in recording, namely :

	6/6	1
	6/9	2
	6/12	3
	6/18	4
	6/24	5
	6/36	6
	6/60	7
Less than	6/60	8

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The first *E* refers to the right eye, the second to the left. Aided vision is recorded when applicable in a similar manner under the figures for unaided vision.

M—By 2, 3, 7 and 8.
S—By 2, 3, 6, 7 and 8.

Any assessment under *M* or *S* other than 2 can be allotted only by a psychiatrist.

Colour Perception

Colour Perception is recorded separately in accordance with the following standards :

Standard I —CP 1—Not in use in the Army.
Standard II —CP 2—Normal colour perception.
Standard III—CP 3—Able to distinguish accurately White, Signal Red and Signal Green.
Standard IV—CP 4—Unable to reach Standard III.

Functional Interpretation of Degree of each Quality

This is shown in the table at Appendix I.

Method of Recording

A "Medical Box" on relevant personal documents shows the degree of assessment under each quality, together with the last two figures of the year of birth, the height in inches, Colour Perception, and weight in pounds. Space in the box is also provided for brief notes where the *P*, *U*, *L* or *S* assessment is below 2.

Application of the System

Since the standards on which PULHEEMS assessments are based are constant throughout all Corps of the Army, except the Women's Corps which have lower standards in *P*, *U* and *L*, and since the functions of the Corps vary, it would clearly be uneconomical to require the same minimum PULHEEMS assessment for combatant, lines of communication and base duties in all Corps. In order to simplify the application of the system the PULHEEMS assessments acceptable to each Corps for each area of operations have been grouped and are expressed in a two-letter code known as the PULHEEMS Employment Standard :

(i) FE (Forward Everywhere). Fit for full combatant duties in any part of the world.
(ii) FT (Forward Temperate). Fit for combatant duties in any area in temperate climates only.
(iii) LE (Lines of Communication Everywhere). Fit for duty in Lines of Communication or Base areas in any part of the world ; may be employed in forward areas in any role not primarily fighting.
(iv) LT (Lines of Communication Temperate). As for LE, but in temperate climates only.

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(v) BE (Base Everywhere). Fit for Base duties only in any part of the world.

(vi) BT (Base Temperate). Fit for Base duties in temperate climates only.

(vii) HO (Home Only). Fit for service in United Kingdom only.

The PULHEEMS Employment Standard is obtained from tables which link the PULHEEMS assessments with specific trades and employments for each Arm of the Service. The minimum standards required vary for officers and other ranks, men and women, entry and retention, and Regular and National Service recruits.

A preliminary PULHEEMS assessment is made by the National Service Medical Board (consisting of civilian practitioners) before the man is called to the Colours. This is mainly a determination of anatomical fitness only, but serves to indicate to the Ministry of Labour and National Service and to the Army whether the man is fit to be called up at all, and if so, the type of duties within broad limits which he is likely to be able to perform. In practice such assessments not infrequently prove to be incorrect because, for example, psychiatric disabilities seldom present at this stage, and there is no objective assessment of intelligence or aptitude.

During the first few days at the Selection Unit a so-called Initial Assessment is made by a Service Medical Officer, mainly to help the Personnel Selection Officer to allot a trade. This is still basically anatomical because many disabilities do not come to light until after initial training. During this time also all recruits are dentally inspected, men with visual defects are referred to a Military Ophthalmic Centre for provision of spectacles, while doubtful cases are seen by a Physical Medicine Specialist or Army Psychiatrist as required. The chest is X-rayed of any man who has not been radiographed before enlistment.

The final "Service" PULHEEMS assessment based on physiological function is not made until after twelve weeks' training, including physical efficiency tests by Physical Training instructors, at the Basic Training Unit. By this time defects and deficiencies have usually become apparent: gross physical and psychiatric disabilities are boarded out of the Army; men with lesser defects are treated and/or allocated to a more suitable trade.

While the PULHEEMS system represents an enlightened advance in methods of medical classification, it is open to the criticism that the degrees of assessment of the *P*, *U*, *L* and *S* qualities are at present determined by more or less arbitrary means. Who, for example, is to say whether the muscular development of a particular limb is average or above average? However, it is hoped that this problem may have been successfully solved before very long, possibly, in the case of the *P* quality, by laying down more fixed standards for the different degrees of assessment together with some form of correlation of bodily measurements, or in the case of the *U* and *L* qualities by a series of standard tests of limb function, using mechanical apparatus and suitably graded in relation to weight, height and age. With regard to Emotional Stability, experiments are in fact proceeding with the object of detecting incipient breakdown under active service

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conditions. If they are successful a further development might well be an objective method of assessing the *S* quality.

(*c*) Physically Underdeveloped Recruits

Underweight recruits are examined at the Selection Unit by a Physical Medicine Specialist who recommends their disposal. Ideally, special Physical Training courses of six to eight weeks' duration should be organized for all men suffering from defects remediable in that time, and in fact Physical Development Centres for substandard recruits were opened in 1936 at Aldershot and in Northern Command. Great expansion took place during the war, when their worth was more than proved, until ultimately three centres in this country had dealt with 35,000 men. Unfortunately, due to a combination of circumstances, there are now no Physical Development Centres—manpower is scarce, there are sufficient trades which may be filled satisfactorily by men of poor physique, and it would be uneconomical at present to send National Service men on long courses, as most of them have only eighteen to twenty-four months to serve. Underdeveloped recruits are therefore discharged from the Army if there is small prospect of their improvement in a short time.

Poorly developed recruits with malnourishment or requiring further investigation are admitted to a Convalescent Depot for extra food and general training. Most of them can be graded P3 after six weeks. Underweight recruits with or without postural deformity but capable of rapid improvement to the standard required for their Arm are sent on Conditioning Courses, together with men who break down, without any discernible pathology, during any part of their training.

Conditioning Courses, which are intended as a substitute for the old Physical Development Centres, are at present held in three of the Commands in this country. Four to six weeks of graduated physical training, with extra milk and higher ration scale, culminate in a standard test. A measure of the success of these courses is that some 80 per cent. pass the test and are assessed P2, L2, U2. In addition to the improvement in physique, posture and endurance, a significant feature is the raising of morale and self-confidence which is almost always evident.

APPENDIX I

PULHEEMS—Functional Interpretation of Degrees of each Quality (*Men*) [13]

"*P*" *Quality:* Age, Build, Strength and Stamina.

Degree 1. Fit after training for full strain and fatigue on combatant duty. Fit to withstand exposure to all kinds of weather. A front-line fighter in any part of the world.

2. Fit after training for normal work or strain but unable to endure "extreme" degree for long periods. A front-line fighter in any part of the world.

3. Fit for ordinary work. Has not the stamina even after training to endure the strain and fatigue of full combatant duty. Fit for restricted service in any part of the world.

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4. Fit in temperate climates, after training, for full strain and fatigue on combatant duty. A front-line fighter in temperate climates.
5. Fit in temperate climates, after training, for normal work or strain, but unable to endure extreme degrees for long periods. A front-line fighter in temperate climates.
6. Fit for ordinary work. Has not the stamina even after training to endure the strain and fatigue of full combatant duties. Fit for restricted service in temperate climates.
7. Capable of performing useful army duties within limits of his disabilities. Not likely to break down if suitably employed which includes time for regular meals and rest. Service in U.K. only.
8. Medically unfit for any form of service.

"U" Quality: Strength, Range of Movement and General Efficiency of Upper Arm, Shoulder Girdle and Upper Back.

Degree 1. Muscle power above average. Must be able to handle a rifle and do heavy manual work, including digging, pushing, dragging, heaving, lifting and climbing. All tasks carried out with rapidity and efficiency.
2. Muscle power average. Able to do all a U1 man can do but at a slower pace.
3. Must be able to use a weapon for defensive purposes and be capable of less severe forms of manual work than U2.
7. Capable of sedentary and routine work of a lighter type. Includes personnel unable to bear arms on account of physical disability. Service in the base area at home or overseas.
8. Medically unfit for any form of service.

"L" Quality: Strength, Range of Movement and Efficiency of Feet, Legs, Pelvic Girdle and Lower Back.

Degree 1. Capable of very severe locomotor strain for five or six days. Can undertake forced marches and fight at the end of such marches. Can run, climb, jump, crawl, dig and perform all kinds of labour quickly.
2. Same as L1, but pace may be slower.
3. Capable of marching five miles or farther in an emergency. Able to stand for periods of at least two hours. Fit for guard duties.
7. Able to walk two miles a day at own pace. Can stand for moderate but not prolonged periods. Service in the base area at home or overseas.
8. Medically unfit for any form of service.

"H" Quality: Acuity of Hearing.

Degree 1. Very good hearing. Ability to hear sufficiently well to perform any duty.
2. Good hearing. Able to hear sufficiently well to perform any duty.
3. Able to hear sufficiently well to perform any duty where moderate impairment of hearing does not disqualify.
7. Able to hear sufficiently well to perform any duty where marked impairment of hearing does not disqualify. Service in the base area at home or overseas.
8. Medically unfit for any form of service.

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"EE" Quality: Visual Acuity.
The degrees entered under EE are simple records of visual acuity, and bear no relationship to the degrees under the remaining qualities. Eye disease may, however, affect the degree entered under "P."

"M" Quality: Mental Capacity.
Degree 2. Ability under army conditions to learn to perform successfully full combatant duties. Includes those who can be trained as tradesmen and specialists.
3. Ability under army conditions to learn to perform simple labouring duties, including fitness to bear arms in self-defence.
7. Because of low mental capacity are unfit to bear arms, but are capable of simple labouring duties under supervision, including a minimum of responsibilities. Service in U.K. only.
8. Medically unfit for any form of service.

"S" Quality: Emotional Stability.
Degree 2. Emotionally fit to perform army duties adequately under full combatant conditions in any part of the world.
3. Although having a history of emotional instability are at present well adjusted and fit to serve in any part of the world in a role which is not primarily a fighting one.
6. Whilst having a history of emotional instability are sufficiently well adjusted to serve in temperate climates in a role which is not primarily a fighting one.
7. Emotionally fit to perform army duties adequately under living conditions favourable to the individual, in the U.K.
8. Medically unfit for any form of service.

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[*To be continued.*]

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At Random

THE EFFECTS OF COLD

"How bitterly cold it is ; I'm frozen to the bone." Such an expression may often be overheard or may even be ejaculated on a slightly chilly morning when the temperature is perhaps 50° F., the humidity high and the fog unpleasant.

The effects of cold are on the whole entirely relative and we, who live usually in temperate climes, are inclined to forget that conditions which we regard as severe cold are the normal for those living in Arctic or near-Arctic circles and that our own chilly type of weather will numb the mental and physical faculties of the peoples of Cairo, Bombay and Rangoon.

The two extremely interesting articles at the beginning of this number stimulated thoughts of the effects of cold, extreme cold, on the body in general, and on our Service personnel in particular ; and life under arctic or near-arctic conditions of intense winter cold, and short hot summers. Personal experience had encountered some of the "trench foot" of 1915-16, and even some typical cases on the Indian Frontier and moderate degrees of "frostbite" in various localities—but had never encountered conditions and results described by Colonel Watts in Korea.

So, with thoughts of a reasonably informative "At Random" on the subject, unhesitatingly we turned to those unfailing sources of knowledge—the Departments of Army Health and of Pathology—for information and notes on which to base the production. The results were somewhat overwhelming—twenty-two sheets of foolscap, closely typed and most carefully compiled notes, and five complete "Training Pamphlets" nearly two and a half inches thick.

So detailed is the information kindly provided and so well set out that, abandoning the attempt at recomposing it as an "At Random," we set it forth here below largely in its original form. This information clearly shows the futility of our opening sentence—"How bitterly cold it is ; I'm frozen to the bone."

A Note on the Pathology of Cold

Most of the work, both clinical and experimental, on the pathology of cold has been done in relation to wet cold, i.e. in terms of immersion foot, trench foot and allied conditions. Such material as has so far been consulted on dry cold—e.g. frostbite and high-altitude frostbite—indicates that the changes are essentially similar, and it is not proposed, in this preliminary study, to attempt to differentiate them.

The outstanding ætiological points are that changes begin when the temperature of the actual tissue falls below 25° F., and that exposures of only few

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hours' duration suffice to initiate extensive tissue damage. The primary changes occur, as might be expected, in the cutaneous blood-vessels; after them, the structures most affected are muscle, nerve and bone.

Blood-vessels.—The changes are comparable with those seen in acute inflammation. The first reaction is a constriction of all vessels—arterial, venous and capillary. With fall in temperature to between 15°-25° F., the capillaries begin to dilate, the arteries and arterioles remaining contracted; the venules and veins then dilate and become engorged, followed by transudation of plasma, diapedesis of erythrocytes, thrombosis and ischæmic changes. In the stage of recovery, intimal fibrosis and vacuolation of muscle fibres, followed by degeneration, occur. It may be that factors other than temperature condition these reactions, for Blackwood and Russell (1943) were unable, in rats under experimental conditions, to demonstrate any organic vascular obstruction. Neither did they find any histological picture resembling that of complete sudden anoxæmia at body temperature. The clinical studies of Friedman (1946), based on over 100 cases of wet and dry cold affections, seem to indicate that thrombosis and ischæmia are the keys to all other changes.

Muscle.—Muscle fibres are probably damaged directly by cold, the appearances resembling those of Zenker's hyaline necrosis. Striation is lost, lumps of hyaline myoplasm form, and may be seen lying free in the muscle-tubes, sarcolemmal nuclei proliferate; the capillaries are congested and the muscle becomes infiltrated by polymorphs. These changes are established within three days, and are of patchy distribution. Muscle atrophy consequent upon nerve changes is not observed for the first four weeks after exposure. In the recovery phase, as may be expected, fibrosis is the rule.

Nerves.—Again the changes may be ascribed directly to temperature, rather than to a consequence of vascular lesions. The essential findings are demyelination, degeneration of axis cylinders and lipoid phagocytosis, with consequent Wallerian degeneration. The amount of nerve damage incurred is proportionately greater than that sustained by other organs and systems. The cutaneous sensory nerve-endings are left undamaged.

Bone.—The lesions are osteoporosis, non-sequestrating atrophy and necrosis, followed by regeneration by the formation of new bony lamellæ subperiosteally and round the Haversian canals.

Other Tissues.—Friedman (1946) has also made observations on skin and connective-tissue fat. The former showed vesiculation of the epidermis, and in the sweat-glands and ducts, vacuolation, degeneration, cystic dilatation and squamous metaplasia. The fat crystallizes and shows fat-necrosis, with formation of oil cysts. Free and intracellular fat is found in blood-vessels. During repair, the fat showed interstitial scarring similar to that found after irradiation.

Notes on the Effects of Cold, its Prevention and Treatment

Central and South Korea have a Cold/Wet climate—in mid-January the temperature may reach −11° F. The mean winter temperature at Seoul is 33° F., i.e. one degree above freezing. Pyongyang may be considered to be roughly 5° F.

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colder. The worst feature of the winter is the wind sweeping down from the great land mass of Manchuria. North Korea has a Cold/Dry climate.

A Physiologist states that the lowest recorded temperature which men have survived with any comfort was $-65°$ F. at Ladd Field, Alaska. They were explorers or prospectors and recorded this temperature during a trek. He pointed out that, if the air was still, then the chilling effect was less than at $-40°$ F. with a wind of 10 m.p.h. Temperatures of $-50°$ F. are very common in the Yukon associated with winds of 10-30 m.p.h.

The *Journal of the Canadian Medical Services* for November, 1943, says :

> "Frostbite was a problem of the greatest magnitude in the German Army last winter. The woollen socks and boots supplied to the men were totally inadequate to meet the rigorous winter conditions. Our Russian Allies report that very few of the captured German prisoners were free of frostbite in major form. Not a few of these cases required amputation."

A pamphlet "Hints on the Correct Use of Cold Weather Clothing" has recently been published by the War Office. It illustrates the clothing and describes how it should be worn. Extracts from the general hints are given :

"Ventilation is all important—zip fasteners have been provided and must be used to regulate the body temperature to prevent sweating and overheating, which saps your strength and energy as well as your resistance to infection.

The garments must be kept away from oil and grease as much as possible, as each successive laundering will weaken their resistance to rain, wind and wear.

Bear in mind the following principles :

(1) Wear your clothing correctly.
(2) Use your clothing correctly.
(3) Keep it clean and dry.
(4) Avoid excessive sweating by ventilating properly.
(5) Protect your clothes and they will protect you.
(6) Wear your clothes loosely.
(7) Brush or shake off snow from your outer garments.

When you find it necessary to wash your garments remember these points :

(1) Rinse out well the soap and dirty water.
(2) Woollens should be washed in TEPID water.
(3) Do *not* rub hard but wash by squeezing.
(4) Foot and handwear should be dried slowly and in a warm atmosphere ; not by direct heat which rapidly dries up the natural oil and greases in leather.

Some useful Hints on the Care of the Feet

1. Wash your feet as often as possible, and dry them carefully, especially between the toes.
2. Wash your socks as often as possible and dry them before wearing.
3. If your feet are numb with cold, remove boots and socks and massage the feet. Use foot powder.
4. If your feet are blistered, report the fact immediately to your N.C.O. or officer, who will decide whether immediate attention by the M.O. is required."

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Frostbite

Frostbite was the typical cold injury in Korea, not trench foot; boots F.P. are leather welted boots designed to be worn with felt insoles and two pairs of socks—they did not stand up well to Korean conditions; boots Boucheron (not issued with the new cold weather clothing) have rubber soles and uppers which are partly rubber and partly of leather, the leather being prolonged calf high. Boots Boucheron were designed for the prophylaxis of trench foot and are not a suitable protection against frostbite; these boots (F.P. and Boucheron) were used last winter, but have been replaced this winter by a new cold/wet boot of leather with composition sole.

Cold Weather Clothing for Korea

During the winter of 1950-51, British Army personnel in Korea were provided with a full range of special clothing and the casualties from cold were not numerous when allowance is made for the very severe climatic conditions to which they were subjected during the stress of battle.

The recorded admissions to hospital for the period November, 1950—February, 1951 inclusive numbered 120, of which 61 were diagnosed initially as frostbite, 37 as trench foot and 22 as exposure conditions.

The trench foot was considered not to have been the classical condition encountered in Flanders in 1914-1918. The frostbite cases were almost entirely confined to the lower extremity. Several cases lost one or more toes, but there was no extensive mutilation; 14 cases were evacuated as patients to the United Kingdom and in about half of all the cases a temporary lowering of medical category was necessary. The average length of stay in hospital was 33 days.

As a result of experience gained last winter no effort has been spared to improve the winter clothing range and many new items of clothing have been dispatched to Korea.

A basic range of special clothing for Cold/Wet conditions has been provided. The term "Cold/Wet" covers those fluctuating climatic conditions in which the temperature is sometimes above freezing point and sometimes below. When Cold/Dry conditions are encountered a number of items is provided which may be worn in addition to the basic range and in substitution of certain items. The Cold/Dry climate can be described as, in general terms, that in which the true winter temperatures are almost continually below freezing point.

Principles of Design

The principles on which the design of the clothing is based are as follows:

(*a*) Provision of a water-repellent windproof external layer made of a "ventile" cloth.

(*b*) The use of the layer system so as to make the maximum use of the high insulation value of air.

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(*c*) The provision of adequate ventilation. This is a vital point, both in the design of the clothing and in the training of troops in its use. Overheating during exertion causes sweating if ventilation is defective. The sweat condensing on the body causes loss of heat and condensation on the inner clothing lowers the insulation value since water conducts heat much more rapidly than does air. When, therefore, the wearer is inactive, it must be possible to close the apertures at the sleeves, neck, ankles and down the front with a simple type of closure in order to enclose the warm air round the body. During exertion, the wearer must be able to open his clothing without difficulty at these points.

(*d*) The clothing must not be so bulky as to interfere with the military efficiency of the wearer.

Clothing for Cold/Wet Conditions

In cold-wet conditions the dress is as follows: The underclothing for the upper body consists of, firstly, a string vest. This is the well-known "Brinje" type which allows a maintenance of a layer of uncrushable air next to the skin and also permits efficient ventilation. Worn loosely over the string vest is the standard issue flannel shirt and over the shirt in turn is a heavy woollen jersey. The jersey may be replaced in the cold climate range by the "combat smock liner" which is now being developed. This is a camel-fleece garment with a front which can be unbuttoned to ensure ventilation.

Underclothing for the lower body consists of "drawers, pyjama type," which are made of cotton knitted fabric with an elastic waistband. There is a back opening which allows the performance of bodily functions while exposing only a minimum area of the body. Outside the drawers are worn "trousers, inner," which are made of a heavy knitted wool.

The outer clothing consists of a combat smock and trousers. The combat smock is made of a windproof gabardine material which is specially treated to give a high degree of water-repellency. It is lined throughout and reinforced at the elbows with the same material. Breast and side pockets are provided. Cords which can be drawn tight when additional warmth is required are fitted on the inside at the waist and at the bottom hem. There is provision for loose or close fastening at the wrist. The front opening is closed by a zip fastener and by buttons. The combat trousers are of the same material as the smock, being lined throughout and reinforced at the seat and knees. Front closure is by a zip fastener and by a button at the waist. The hem at the bottom of the legs forms a channel through which, by means of two button-holes, a cord may be threaded for drawing the trousers close to the ankles. Because of the extreme fluctuations of temperature associated with the winter climate in Korea provision has been made for the "middle parka," a wool-lined jacket which is normally part of the Cold/Dry range of clothing, to be worn with the Cold/Wet clothing as an additional garment during periods when the temperature is exceptionally low.

The head-dress is of the ski-cap type made of waterproof rubberized gabardine with a generous peak and flannel-lined ear-flaps. A hood is provided with

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the combat suit. It is made of the same material as the smock and can be attached to it by buttons. It has a draw cord in order to close the opening for the face to as small a size as possible.

The hands are protected by woollen wristlets, by three-compartment woollen gloves, and by an outer glove which protects the woollen glove from snow and damp.

On the feet are worn two pairs of woollen socks and a pair of special "boots, cold/wet." These boots are made of leather with a moulded composition sole. They are of sufficient size to accommodate, in addition to the two pairs of socks, a special open weave insole which affords insulation and ventilation by providing a layer of warm air under the stockinged feet. A pair of short puttees is worn with these boots.

Clothing for Cold/Dry Conditions

Under Cold/Dry conditions a number of extra garments are required. The underclothing and combat smock are worn as previously described. Additional outer garments are provided to be worn outside the combat clothing. These consist of, firstly, the middle parka which is a jacket of water-repellent and windproof cotton gabardine fully lined with a wool pile. It has a large hood which can be worn over a combat cap or a balaclava helmet. The front cowl of the hood has malleable wire at its outer edge which can be bent to allow the front to be altered to suit varying wind conditions. There is a waist draw-cord on the inside of the parka and a crutch strap which when required passes between the legs and fastens to two buttons in front of the pockets. Straps which can be tightened and released while wearing gloves are provided at the cuffs. The parka is ventilated by opening the front, loosening the waist draw cord and cuff straps and by unfastening and partially or completely lowering the hood. Under very extreme arctic conditions an "outer parka" can also be provided which is worn over the middle parka and is similar to it except that it has an unlined hood. Additional protection for the hands is provided by woollen wristlets, by the "gloves, woollen, 3-compartment" mentioned above, and by outer gauntlets of leather.

Perhaps the most important change in this type of clothing from that worn under Cold/Wet conditions lies in the footwear. The special "boots, cold/wet" are not worn. The feet are clothed first in three pairs of woollen socks ; outside these is worn a pair of duffel socks which are made from a medium weight felt. Instead of the leather boots, "boots, cold/dry (Mukluks)" are worn. These are calf-high loose-fitting canvas boots with rubber soles. They are not suitable for wet conditions. They are provided with insoles made partially of felt and partially of plastic, the felt side being worn uppermost towards the foot.

Under both Cold/Dry and Cold/Wet conditions a white overclothing consisting of a jacket and trousers may be worn as personal camouflage in the snow.

Snow goggles for protection against snow blindness can be made available when required. An issue of a colourless lip-stick for the protection of the lips against "chaps" is made to each man, and supplies of Lanoline are available for the protection of the exposed skin.

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Clinical and Other Notes

A CASE REPORT ON A CALCIFIED TUMOUR OF THE LID

BY

C. W. A. SEARLE, M.D., D.O.M.S.

Ophthalmic Department, Military Hospital, Colchester

A CASE report is given on a soldier, who had a chalazion which had undergone calcified degeneration. This is an unusual complication of a chalazion. Had it not been removed, it could have caused ulceration or abrasion of the cornea, on account of its roughness and hardness.

Driver B., R.A.S.C., aged 19 years, service 11 months, was referred to the Department on 18th July, 1951, by his M.O. with a tumour of the right upper lid. There was no history of injury or foreign body. The duration was of about six months.

On examination, inspection and palpation of the right upper lid revealed a hard tumour about the size of a pea, and in every respect similar to a chalazion in the centre of the lid. The eye was white. Eversion of the lid showed a hard white circular mass, measuring 3 mm. across, and protruding beyond the tarsal plate 1 mm., with a rough, hard surface. It was diagnosed as a chalazion which had undergone calcified degeneration.

Driver B. attended as an out-patient, and the tumour was removed on 2nd August under 2 per cent. novocaine infiltration of the lid, by a circular incision 2 mm. beyond its borders, complete, easily, and adherent to the adjacent tarsal plate on its borders. He was seen again on 16th August. A small linear scar at the place of removal could be seen on eversion of the lid. There was no lid deformity and he was discharged cured.

Captain A. Kundsen, R.A.M.C., Officer-in-Command of the Laboratory of the hospital, was kind enough to section the tumour, and reported as follows: "The section shows a tiny sebaceous cyst with degeneration of the wall, and foreign body giant cell reaction around the partly calcified sebaceous material."

I have to thank Lieut.-Colonel W. Arundel, Officer Commanding, for permission to publish this case.

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REMOVAL OF CASUALTIES FROM ARMOURED CARS

BY

Major J. E. ELLIOTT, M.B., B.S., D.(Obst.)R.C.O.G., T.D.
Royal Army Medical Corps (T.A.)

In most armoured cars there are three possible ways of getting out: up through the turret; out through the side escape hatch; and, in the case of the driver, up through the hatch directly above the driver's seat.

These three alternatives compare as follows:

The Turret

This is the usual way in and out for all members of the crew. The top is easily opened and, though the passage way is encroached upon by the breech of the 2-pdr. gun and other items of equipment, it is the roomiest way of the three. The main drawback in the case of the helpless man is the vertical lift from the floor to the top of the turret opening, a height of 4½ feet.

The Side Escape Hatch

This is on the level with the floor of the armoured car and at first sight would appear to be the most obvious way to remove a casualty. In action, however, the 2-pdr. bag and the Besa bag might be formidable obstructions, especially if they were half full of expended rounds. For complete access to the side hatch it is also necessary to traverse the turret slightly to one side. Apart from this preliminary clearing of the way, a wounded driver would have to be bent round sideways to a considerable degree to bring him through.

Under small-arms fire, however, this is the method of choice, as the rescuers are not exposed above silhouette of the vehicle.

The Driver's Hatch

This is a comparatively small aperture, 18 in. by 10 in., and, whereas a driver of normal build can emerge through it fairly easily, the lifting of a helpless man can be extremely difficult. Apart from the smallness of the opening, it is very difficult to extract the man's legs from under the large steering wheel, which fits low on the thighs. As injury to the lower limbs is particularly frequent in drivers, an attempt to pull directly upwards might, in fact, cause further damage. The fit of the steering wheel is so tight against a larger man's thighs that it is common practice for the more hefty drivers to unscrew the steering wheel from the steering column, before getting in and out again. A small point is that the barrel of the 2-pdr. gun normally lies directly over the hatch, and the turret has to be traversed slightly to move it clear.

There is no doubt, therefore, that as far as the helpless driver is concerned, the first step should be to pull him back from his seat into the main compartment.

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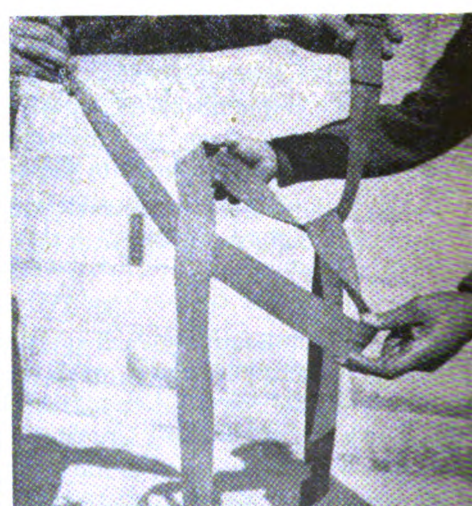
The Barrel Lift

This is a method of using a 12-ft. length of webbing for lifting a helpless man from the floor of the main compartment of the car up to a sitting position on the rim of the turret.



The 12-ft. webbing is made extemporaneously by joining two standard stretcher slings (threading the looped end of one through the buckle of the other).

It may also be made up from the standard webbing equipment by joining together four straps supporting and one webbing brace, the latter being in the middle as it is broad and more comfortable for the crutch. The principle is the same as that of the R.A.M.C. barrel bandage used for supporting fractured jaws.

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One end of the length of webbing is threaded through the crutch, until the ends are equal when held up vertically above the man's head. A simple knot (first half of reef) is tied and drawn down until it rests on top of the man's head. The knot is now opened and eased down over his head and shoulders to a point just above the elbows on each side. The sling is now drawn tight, pinioning the arms to the side.

The injured man may now be raised easily and with good control by two men standing fore and aft on top of the turret.

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THE DRILL

The drill movements for the two rescuers are as follows :

Both climb up the outside of the armoured car to the turret opening.

No. 1 descends into the main compartment with one end of the webbing, the other end being retained by No. 2, who takes up a position on the forward part of the turret opening. No. 1 threads the webbing through the man's crutch and passes it up to No. 2, who, when the ends are equal in length, ties the knot and draws it down on the man's head. He retains a loose hold of the two ends while No. 1 opens the knot and eases it over the head and shoulders, and down to the correct position just above the elbows. He then tightens it, being careful to keep

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the straps up from the man's crutch quite vertical so that they pass up the front and back of the man's body in the mid line. As soon as No. 1 indicates that the sling is in position No. 2 pulls the ends up and holds them taut. No. 1 then climbs out of the turret and takes up his lifting position on the afterpart of the opening, facing No. 2. They then together raise the man with a steady pull, and bring him into a sitting position between No. 1's legs on the afterpart of the turret rim. No. 2 steadies him in this position, while No. 1 jumps down on to one side of the engine cover. He in turn supports the man while No. 2 jumps on to the other side of the engine cover. Then, one on each side, they ease him backwards and head first down on the engine cover. No. 2 now steadies him, while No. 1 jumps to the ground, and removes him by a back lift, his legs being eased off by No. 2.

Actual Use

Several methods have been advocated and used in the past; notably, making armoured car crews (especially drivers) wear their basic webbing equipment in action; also the wearing of a special web harness with a parachute type of fitting round the thighs and handle straps on the shoulders. But in the first instance the buckles of the equipment and its tightness tend to interfere with quick and free movement, and in the second the provision of a specially made harness may not be administratively practical.

In this connection an interesting comment is made by officers who have fought A.F.Vs. In their experience the instincts of self-preservation and comradeship are so strong that even badly wounded men manage somehow to get themselves out when the occasion arises. It was rarely necessary to remove any wounded man who had any chance of survival, and therefore the call for specially made harness might seem hardly justifiable.

Advantages

Points in favour of the barrel lift may be summarized as follows:

The materials used may be improvised from standard equipment (stretcher slings or individual webbing equipment, or even rope).

The sling when correctly applied is quite comfortable and relatively non-traumatic for the casualty, as the strain is distributed over the body.

The sling will not slip and the body is automatically kept upright, making the lifting a straightforward pull with both hands, no additional steadying being required.

It can also be adapted for lifting up casualties by ropes from ravines, or for raising up casualties into a hovering helicopter. All that is necessary is to join the two loose ends above the man's head by threading the one through the carrying buckle. The resulting union will take a heavy strain.

Grateful acknowledgement is made to all concerned for their help and encouragement; especially to Col. G. E. Parker, D.S.O., A.D.M.S., Lt.-Col. J. G. Scott, O.C. Inns of Court Regt., Lt.-Col. D. M. Ahern, D.S.O., O.C. Field Training School, R.A.M.C., and the photographer, Sgt. F. L. Banner.

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Matters of Interest

H.M. The King has approved the alliance of the Royal Army Medical Corps with the Ceylon Army Medical Corps.

Major-General Frederick Harris, *C.B.*, *C.B.E.*, *M.C.*, K.H.S., late R.A.M.C., has been appointed Director-General, Army Medical Services, with the rank of Lieutenant-General, and with effect from 1st April, 1952, in succession to Lieutenant-General Sir Neil Cantlie, *K.B.E.*, *C.B.*, *M.C.*, K.H.S., late R.A.M.C.

HEALTH CONGRESS PRESIDENT

The Right Hon. Lord Moran, *M.C.*, M.D., F.R.C.P., has accepted the office of President of the Health Congress of the Royal Sanitary Institute, which is to take place at Margate from 22nd to 25th April, 1952.

A BROCHURE OF THE ROYAL ARMY MEDICAL CORPS

In 20 pages the War Office and Central Office of Information have, at the instigation of the Director-General, produced now a printed brochure embodying all the data about the Corps which used to be contained in the general hand-out made to young officers on first appointment. It is a well-got-up production, neat, handy and a veritable mine of information even to those who are no longer young officers or L.O.Ps. It is well worth both perusal now and retention in one's permanent collection. This brochure, together with Lovegrove's "Not Least in the Crusade," should form a very full and solid foundation of knowledge about the Corps for any future Officers of the Corps.

CASUALTIES IN THE MEDICAL SERVICES

Previously reported missing, now known to be a prisoner of war: Captain A. M. Ferrie, R.A.M.C.

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29 GENERAL HOSPITAL, KURE, JAPAN

From a group of illustrations issued by "Public Relation" we have selected the two given below which may be of interest to readers and will undoubtedly be

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to those more intimately concerned. Pictures of hospital Wards have much of a sameness as a rule, but the one given here shows that at least in one of our hospitals accommodation is on a pleasant scale.

[*Photo: Public Relations, H.Q., B.C.O.F.*

There was also one picture of the hospital grounds which seemed almost too beautiful and stage-like to be true, showing three members of the Q.A.R.A.N.C. ministering to the needs of the hospital goldfish. We leave it to the imagination ; perhaps our sister journal would care to publish it.

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NOTES FROM THE DIARY OF THE DIRECTOR-GENERAL, A.M.S.

THE Director-General went to the B.A.O.R. Manœuvres from 17th to 22nd September. He visited the R.A.F. Hospital, Rinteln, on 18th September, and inspected the Military Hospital, Hamburg, on 24th September. With the D.M.S., B.A.O.R., Major-General R. D. Cameron, he visited Denmark on 25th and 26th September at the invitation of Major-General C. R. H. Fasting-Hansen, the Director-General of Medical Services, Royal Danish Army, whom many senior officers will remember attending Exercise "Horatius" in December, 1950.

A visit was paid to the Military Hospital in Copenhagen of 500 beds, which is of a high standard, the staff composed of doctors on the reserve of officers. An interesting point is that the hospital is commanded, not by a medical officer, but by a senior officer of any branch of the service, and in this case by a major-general of the Engineers.

They were also able to meet Colonel Jorgansen, who also attended Exercise "Horatius" last year; also the principal Danish naval medical officer of the Danish hospital ship *Jutlandia*, which had recently returned from Korea with over forty British invalids, landed at Southampton.

The D.G.A.M.S. attended the Annual Dinner of the Royal College of Obstetricians and Gynæcologists, which was held at the Dorchester Hotel on 28th September, 1951.

October seems to have been a well-filled month for the Director-General. On the 1st he attended the opening of the Westminster Hospital Medical School, he then went to a Cocktail Party which was held at Claridges Hotel by the Editors in memory of the thousandth issue of *The Lancet*; he gave an address to the B.M.A., Portsmouth Branch, on 2nd October, on present-day problems of the Army Medical Services; then was a guest at the London Hospital Old Students' Dinner at the Trocadero Restaurant on the 4th and at a Cocktail Party on 8th October which was given by the Canadian Army Liaison Staff in honour of Major-General Macklin, the Adjutant-General of the Canadian Army.

The Annual Meeting of the General Council of the Roehampton Hospital was held on 10th October, Major-General Sir Ralph Ainsworth in the Chair and the D.G. was present. A visit was paid after lunch to the Limb Fitting Centre and the Research Centre for Artificial Limbs.

On the 12th the D.G.A.M.S. was invited to the R.A.F. Medical and Dental Dinner at the Hyde Park Hotel.

From 13th to 16th October the D.G. attended the U.K. Manœuvres and the C.I.G.S. Conference on 17th October, and the Generals' Convention on 18th and 19th October.

At the R.A.M.C. Ranker Officers' Dinner, which was held at the Palmerston Restaurant, Bishopsgate, on 19th October, the D.G., in his speech in response to a toast of "The Guests," outlined the present position with regard to non-medical officers in the Corps.

On the 20th October he was asked to give an address on "The Origin and

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Progress of First Aid" at the Annual Meeting of the Brigade Surgeons of the St. John Ambulance Brigade and was a guest at the reception and dinner at the Waldorf Hotel, where he proposed the toast of the "St. John Ambulance Brigade"; on the 23rd he and Lady Cantlie attended a Supper given at the Indian Services Club, to meet General K. M. Cariappa, Commander-in-Chief of the Indian Army; and gave an address to the Students Medical Society of Leeds University on 26th October on the subject of the "Army Medical Services."

The Central Mediterranean Force Surgeons' Dinner was held at Claridges Hotel on 27th October. The D.G. was present and the guests included Brigadier J. M. Weddell and Mr. Churchill, Professor of Surgery at the University of Boston, who was closely associated with the North African and Italian theatres during the war.

He and Lady Cantlie finished the activities of the month by an "At Home" given by the Empire Medical Advisory Bureau at B.M.A. House on 29th October, to meet doctors from the Commonwealth countries who are undergoing courses of studies in this country, and an "At Home" given by the British Red Cross Society for the St. John and Red Cross Service Hospitals Welfare Officers at the Forum Club.

A Guest Night was held at the H.Q. Mess, Millbank, on the 25th October. The principal guest of the evening was Major-General K. A. M. Tomory on his retirement from the Corps. The other guests included Air Vice-Marshal J. M. Kilpatrick, D.G.M.S. of the R.A.F., Dr. K. Pridie, Principal Medical Officer of the Colonial Medical Service, Dr. G. Findlay, who had the same day given a lecture in the R.A.M. College on "Recent Advances in Chemotherapy," and Lieut.-Colonel F. M. Lipscombe, R.A.M.C.

In a short speech the Director-General said that we were "dining out" one of the most popular officers in the R.A.M.C.—Major-General Tomory. He outlined General Tomory's career, expressed to him the thanks of the Corps and wished him well in the future. He referred to the presence of other guests and pointed out how close co-operation with the Medical Services of the Royal Air Force and the Colonial Service was at present. Lieut.-Colonel Lipscombe, he said, had been "dined out" as a mess guest because of his generous and interesting gift to the Mess of the collection of photographs from the R.A.M.C. Mess in Rawalpindi, dating from 1892.

General Tomory replied in an amusing speech and the toast was drunk with musical honours.

22nd GENERAL HOSPITAL

A Reunion Dinner of the 22nd General Hospital, R.A.M.C., was held at Liverpool on 29th September, with Colonel A. McKie Reid in the chair. Colonels S. O. Dolan and P. R. Hawe, Lieut.-Colonel K. McL. Cobban, and Majors

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R. Selby, W. E. Spence, H. G. A. Almond, and A. Langford Williams, with members of the nursing staff and other ranks, were present to the total of sixty. The next dinner will be held on Saturday, 27th September, 1952, and inquiries should be addressed to Mr. Clifford Cooke, 17 Greenhill Avenue, Liverpool, 18.

NOTES FROM A.M.D.

BY OUR SPECIAL CORRESPONDENT

It is with some surprise that we find ourselves still appearing in print, in view of the general impression that the JOURNAL had found the cost of living too much for it. It is not for that reason, however, that we find ourselves temporarily bereft of our conversational powers. Nor can we in fairness claim that we have not yet recovered from the Christmas festivities or the New Year celebrations. As you read these lines, dear readers, you may still be struggling to re-orientate yourselves after these commemorative activities. We ourselves are still nursing our wounds after collaborating with our children in imitation of the pyrotechnical Guy Fawkes, and even Thanksgiving Day has not yet arrived. No, the fact is that there is little or no activity in the subjects which normally provide us with our material. There are no honours, no awards, no retirements and we have completed our world tour. We have only the Army List to fall back on.

Turning to the Army List, we avidly seize our red pencil, having obtained a brand new Army List published in August of this year. We are really the first in the field at last. But even here we find a dearth of news. Captain (Quartermaster) W. H. Carlton to be Major (Quartermaster) October 27, 1951 ; Captain (Quartermaster) F. J. Downes to be Major (Quartermaster), November 7, 1951; Lieut. L. Tippett to be Captain, October 1, 1951.

Readers who are able to turn to the August number of the Journal may be interested if we mention the changes which have occurred since we carried out our tour of the home commands. We should also like to correct a few errors which have crept in. At the War Office the Inspector of Training is now Brigadier F. McL. Richardson. The Adviser in Physical Medicine is still Lieut.-Colonel J. B. M. Milne, but his initials are as now stated, and not as previously shown. The D.D.M.S., Eastern Command, is now Major-General F. K. Escritt, and the A.D.M.S., East Anglian District, is Colonel S. W. K. Arundell. At the College, Major-General Mollan's name is as now spelt. The Reader in Army Health is Lieut.-Colonel R. J. Niven. Lieut.-Colonel R. J. G. Morrison is now O. i/c Medical Division at the Queen Alexandra Military Hospital, Millbank. The A.D.P., Eastern Command, prefers his name to be spelt Warrack and we sympathize—our own names are always being mutilated.

At the Military Hospital, Colchester, Lieut.-Colonel S. G. M. Lynch is now in command. Lieut.-Colonel N. Bickford is A.D.M.S. at Southern Command and Colonel P. F. Palmer is A.D.M.S., Aldershot District. A.D.M.S., Salisbury Plain District, is Colonel I. H. C. Morton. Lieut.-Colonel A. P. Trimble is in

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charge of the Medical Division at the Cambridge Hospital, and O.C. Louise Margaret Hospital is Lieut.-Colonel N. G. G. Talbot.

Lieut.-Colonel L. G. Irvine has succeeded Lieut.-Colonel C. A. Levy as O.C. Military Hospital, Wheatley, and Lieut.-Colonel R. C. Langford commands the Connaught Hospital at Hindhead.

Colonel R. V. Franklin is now A.D.M.S., Catterick District, and O. i/c Surgical Division at the Military Hospital, Catterick, is Lieut.-Colonel E. W. O. Skinner. D.D.M.S., Scottish Command, is Brigadier E. P. N. Creagh and Lieut.-Colonel C. L. Day is his A.D.A.H. A.D.M.S., Highland District, is Colonel W. S. Martin.

In Western Command Colonel J. M. Ryan has taken over the duties of A.D.M.S., North-West District, from Colonel W. C. MacKinnon.

Whilst sorting the wheat from the chaff amongst some old papers the other day we uncovered the following piece of English misusage, which we reproduce as written. The envelope was addressed to :

Cairo,
Esq. The Chief of the Hospital,
Pritch Army
At Helmieh El Zatoon,
Cairo.

and the letter enclosed in its grubby folds was couched in the following terms :

The Doctor of British Army Hospital

DEAR SIR,

I am Desouki Ibrahim Ahmed has worked for several years as a Tomorgy in the Government hospitals and have several sertificates to verify my words.

I hope to be one of the employments in the hospital. I was also at the British Army's service in the Greatest War. I read and write Arabic and speak some English words. I am 30 years old.

I hope that my application will find your attention,

Your servant
DESOUKI IBRAHIM.

We should, we are sure, have sent a courteous acknowledgment, but there was no address of the sender. Nor did we ever hear more of him. He was doubtless unable to raise the required sum to cross the palm of the ghaffir who guarded the gate and patrolled the wire of Helmieh Camp. This letter set us thinking of the many devoted Egyptian servants employed by the R.A.M.C. at the Citadel and at Helmieh, at Tel-el-Kebir and Moascar and Abbassia. Current events may give us little cause for patience with the Egyptians, but some had served the Corps for many years and were indeed "good and faithful servants."

HONORARY CONSULTANTS RETIRED W.E.F. 24TH OCTOBER, 1951

Colonel D. B. McGrigor, *O.B.E.*, M.B., Hon. Con. to the Army in Radiology.

Colonel R. O. Ward, *D.S.O.*, *O.B.E.*, *M.C.*, *T.D.*, M.B., F.R.C.S., Hon. Con. to the **Army in Genito-Urinary** Surgery.

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Colonel A. S. Daly, F.R.C.S., Hon. Con. to the Army in Anæsthetics.

Lieut.-Colonel Sir Thomas Fairbank, *D.S.O.*, *O.B.E.*, Hon. Con. to the Army in Orthopædic Surgery.

Victor Bonney, Esq., M.D., M.S., F.R.C.S., Hon. Con. to the Army in Gynæcology and Obstetrics.

A. G. Anderson, Esq., M.A., M.D., F.R.C.P., Hon. Con. to the Army in Scotland in Medicine.

Sir Thomas P. Dunhill, *G.C.V.O.*, *C.M.G.*, *M.O.*, F.R.A.C.S., Hon. Con. to the Queen Alexandra Military Hospital, Millbank, in Surgery.

Sir Harold Gillies, Kt., *C.B.E.*, F.R.C.S., Hon. Con. to the Army in Plastic Surgery.

T. F. Cotton, Esq., M.D., C.M., F.R.C.P., Hon. Con. to the Queen Alexandra Hospital in Cardiology.

Major-General Sir Arnold W. Stott, *K.B.E.*, F.R.C.P., Hon. Con. to the Army in Medicine.

Brigadier T. S. Osmond, M.B., Hon. Con. to the Army in Venereology.

HONORARY CONSULTANTS INVITED AND ACCEPTED

To the Army

Sir Stamford Cade, Hon. Con. in Radiotherapeutics.

Prof. T. P. Kilner, Hon. Con. in Plastic Surgery.

E. W. Riches, Hon. Con. in Genito-Urinary Surgery.

H. W. Davies, Hon. Con. in Radiology.

B. R. M. Johnson, Hon. Con. in Anæsthetics.

A. J. King, Hon. Con. in Venereology.

Prof. E. J. King, Hon. Con. in Biochemistry.

E. Bedford, Hon. Con. in Cardiology.

Prof. L. P. Garrod, Hon. Con. in Antibiotics.

Prof. P. A. Buxton, Hon. Con. in Entomology.

J. W. Scadding, Hon. Con. in Diseases of Chest (including Tuberculosis) at the Queen Alexandra Military Hospital, Millbank.

To the Army in Scotland

Prof. T. F. Rodger, Hon. Con. to the A. in S. in Psychiatry.

B. M. Dick, Hon. Con. to the A. in S. in Thoracic Surgery.

Prof. A. B. Wallace, Hon. Con. to the A. in S. in Plastic Surgery.

G. I. Scott, Hon. Con. to the A. in S. in Ophthalmology.

J. Wallace, Hon. Con. to the A. in S. in Blood Transfusion.

R. B. Lumsden, Hon. Con. to the A. in S. in Oto-rhino-laryngology.

R. Y. Keers, Hon. Con. to the A. in S. in Diseases of the Chest (including Tuberculosis).

LAST VOLUME

This Number of the Journal begins, not only a new Volume and that volume produced by a new printer, but what may well and probably will be the last volume of the Journal of the Royal Army Medical Corps.

The cessation of a Journal which has flourished for nearly fifty years and which has established a world-wide reputation as the best of all the Military Medical Journals from any country is to many a reader a sad event.

But the cessation of publication is due to no lack of writing talent, no lack of

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material for publication, both actual and potential; but due to the simple fact, which has been already emphasized, that publication cannot continue indefinitely at a loss. The income is, in fact, not covering expenditure. The costs of paper, printing and production have *trebled* in the past fifteen years; the selling price of the Journal has not; and some of the subscription is used by the *Gazette*, The present income will not meet expenditure.

That income is even now falling steadily because *all Officers of the Medical Services no longer support their Journal by their subscriptions.*

If every *reader* had made sure that he was a *subscriber* and if every *subscriber* had made sure that every friend in the Medical Services also *became a subscriber* the present volume would not have been the last.

If you wish for this Journal to survive, even though only in the spirit of a Phoenix rising from the funeral pyre of our old Journal, then it is up to you, up to every *subscriber* to ensure that every member of the Medical Services becomes a reader and every reader a subscriber.

Correspondence

COMMAND PSYCHIATRIST'S OFFICE,
THE Q.A. MILITARY HOSPITAL,
MILLBANK, LONDON, S.W.1.
12*th December*, 1951.

DEAR SIR,

It is regrettable that after seeing fit to publish in a Service journal "A Criticism of Military Psychiatry in the Second World War," by Captain H. J. C. L'Etang, R.A.M.C. (T.A.), the editorial policy should have been to issue this article in three instalments.* This effusion, which is extremely provocative and itself open to severe criticism, could not be effectively answered until the concluding part appeared in print. By this time most of the readers have either lost interest or have been so confirmed in their anti-psychiatric preconceptions that they are unlikely to be swayed by opposing arguments.

As interesting as it would be to know the unrevealed personal grievances which motivated the author, this aspect must be disregarded in favour of a few general criticisms. In Part I he quoted a few sketchy case histories of unit personnel who he feels had been mishandled by psychiatrists. The fact appears to be that this officer had not benefited from his long service as an M.O., and was as inexperienced in dealing with men at the end as he was at the beginning. Most of these people could have been dealt with adequately in the unit by a

* This extremely welcome and usefully critical letter was unfortunately received too late for the make-up for December.

The reason why the article was published in three parts was simply a matter of length and the interests of many types of reader.

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Medical Officer with some "Know-how" before even being referred back to a military psychiatrist. Secondly, he complained of the lack of liaison between the R.M.O. and the specialist psychiatrist. In my own experience, any R.M.O. who has had the drive and initiative to discuss his cases personally with the psychiatrist has received the most sympathetic consideration and willing co-operation. It is the combination of inadequate case histories, lack of any helpful guidance from the R.M.O. and the tendency to regard the psychiatrist as a mixture of lie-detector and wet-nurse which occasionally forces the psychiatrist to recommend some arbitrary disposal. Part II is hardly worth criticism. The author has taken a carefully selected number of cases from all the services, apologizes for his unscientific and fallacious approach, and then gives his own personal criticisms, unsupported by any specialist psychiatric training, of the disposal of patients years after their return to civil life. He admits that his methods of investigation were open to doubt and that he had no detailed knowledge of the circumstances in which these men broke down.

Part III consists of some confused arguments and a hotch-potch of references entirely divorced from their contents, assembled with the idea of supporting in a pseudo-scientific manner the ineradicable preconceived theory of the author. He has carefully ignored the articles and authoritative follow-ups which demonstrated that the psychiatric policy in World War II had many points in its favour.

However, my immediate concern is much more with your anonymous contribution, "At Random—Psychiatric Wastages" (November, 1951), which is presumably an official expression of editorial opinion.* This is so full of misconceptions and sonorous platitudes that it appears to be the creation of somebody who scans a table of statistics, glances over a few graphs, and then makes didactic pronouncements without having any genuine knowledge of the practical problems which are being discussed, or the very real difficulties placed in the way of the man-on-the-spot who has to solve them.

The point which both authors make and nearly belabour to death is that too many soldiers were invalided out of the Army, or were rendered ineffective as combatants, on psychiatric recommendations. I do not think anybody could cavil at the statement, but what is objected to is the unfair emphasis placed on the psychiatric disposals, when nearly every other branch of the Medical Services was equally at fault. Psychiatrists do not create psychiatric disability, they only recognize what is already there, and do their best with the human material and the Army facilities to make the Army a reasonably well-integrated machine. Hypodermic syringes and scalpels and professional slovenliness amongst inexperienced, untrained and incompetent medical officers were of more danger to the well-being and effectiveness of the Army than the pen in the hand of any military psychiatrist. It is absurd to talk of the specific liability of the psychiatrist in manpower

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* The "At Randoms" which at present appear in this Journal do not give official opinions. The Editor alone is responsible and his name is readily available. "At Random" is an endeavour to provoke critical articles and correspondence.

We like the "*full of misconceptions and sonorous platitudes*" and "*a few woolly and unconstructive suggestions.*"—ED.

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wastage, when it was perfectly obvious in overseas commands that large numbers of officers and men, with no suspicions of physical or emotional disorder, were being permanently retained in employment of a nominal nature and contributed a negligible amount to the war effort, even at its most critical periods. The psychiatrist had little to do with those cases of professional incompetence and neglect, particularly amongst officers, which should have been dealt with on a disciplinary basis, but which not uncommonly led to promotion and wider scope for their powers of disorganization, on the usual instructions from a senior officer, "I don't care what you do, as long as you get rid of him."

Furthermore, this extraordinary habit of comparing various wars in order to pontificate over psychiatric breakdown in the British Army in World War II is characteristic of those blinkered, obtuse minds which readily draw illogical conclusions from invalid data. Almost in every way, apart from actual combat, the circumstances under which the British soldier lived out his war service were different in the two World Wars and certainly were different again from those of the American Expeditionary Forces. Because in the First World War, or any preceding one, nobody commented very much on psychiatric disorder, this does not mean that it did not exist. The peculiar hazards of trench warfare, concealed suicide, and diseases about which knowledge was rudimentary and empirical did a lot to eliminate the potential psychiatric casualties before they became recognized as such. The point which everybody appears to miss is that in 1914 the Army had the pick of young and enthusiastic volunteers. From 1939 to 1945 the Army in Britain was left to reconstitute itself from a rather doubtful reservoir of manpower, *after* the reserved civilian occupations, the Royal Navy and Royal Air Force had taken their choice of the most obviously suitable applicants. It is not necessary to emphasize the facts that in 1939-1945 indiscriminate bombing in U.K., disintegrated families and long absences overseas, associated with a recognized increase in neurosis in the civilian population at large, did much more to affect the serving soldier with dependants than any distaste for military service.

This article bears out the frequently made observation that psychiatrists generally receive much more support and encouragement in the performance of their duties from combatant officers than they do from executive and unit medical officers.

Again with an air of patronage the author states that the psychiatrist is possibly of some use in certain critical war situations. It probably has never occurred to him that the whole function of the psychiatrist in selection procedure is not to prepare himself to give first-aid in a desperate situation, but to make sure that those men who are likely to be exposed to extreme stress should be, as far as one can ascertain, able by their own efforts to resist emotional disintegration. The preparatory work of the psychiatrist should have been finished before these situations occur. After he has repeated to his own satisfaction a few truisms, which have been long appreciated by every reasonable sociologist—who, however, does not ignore the fact that some men will never become efficient soldiers or respond to unimaginative regimentation—he makes a few woolly and inconstructive suggestions, and then settles back comfortably to let somebody else get a headache.

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Military psychiatry is the newest of the service specialities, and by force of circumstances it is learning by bitter experience and from its mistakes, which when taken against the whole complicated background of Army administration are neither as many nor as serious as its detractors would have hoped. The small group of Regular officers who practise full-time psychiatry does so under conditions in which prejudice and unnecessary criticism play no small part. They also realize that in the event of another war they would probably be relieved of their specialist duties in order to take some administrative appointments, or unit commands commensurate with their age, rank and seniority. This policy does not promise a co-operative attitude towards those civilian psychiatrists who will have to bear, inexperienced in military matters as they may be, the future burden of the psychiatric services. These men will have to do the job, and unless they have a clear and definite policy laid down from the very beginning, with co-operation and guidance from all branches, particularly the senior executive medical officers, they will be forced, as frequently occurred in World War II, to recommend such disposals as they think fit within the limits of their own specialist and military knowledge.

H. POZNER, D.P.M., *Lieut.-Colonel, R.A.M.C.*,
Command Psychiatrist, Eastern Command.

TO THE EDITOR, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

THE WAR OFFICE,
LONDON, S.W.1.

From The Director of Army Psychiatry. *20th December*, 1951

SIR,

Many military psychiatrists would, I think, agree with much of the survey of psychiatric wastages given in "At Random" (November, 1951, page 389). Some of "At Random's" inferences, however, may be questioned. For example, the disproportion between the number of active service overseas divisions in 1945 and 1918 may well be due to reasons other than a totally disproportionate loss of serviceable men in the second war.

The number of men pensioned for psychiatric disorders in the First World War indicates only the number awarded pensions. All psychiatric casualties did not receive pensions, and an unknown number may have been discharged with a medical or surgical diagnosis, i.e. D.A.H., etc.

"At Random" stresses that all the pensioned psychiatric casualties had served on an average eighteen months in an active theatre. There are ways of spending time in an active theatre other than those gainful to the service, and, in any case, one would expect that considerable service in an active theatre would in most cases be necessary in order to qualify for a pension.

"At Random" compares the incidence of psychiatric casualties in the 1939-45 war with other wars in the past forty years. Presumably, the implication the writer had in mind was that the incidence in the 1939-45 war was due to the magnified attention which he stated they received in that war. It is suggested

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that the writer read the "Report of the War Office Committee of Inquiry into Shell-Shock," with its description of the large numbers of such casualties evacuated in 1916, and this at a time when no psychiatrists were functioning as such in the British Army. It is questionable whether medical science had advanced to a reasonable discerning stage in the wars of the years immediately prior to World War I, as the writer of "At Random" asserts. A perusal of the medical literature of that day does not support the claim.

It would seem a pity that, although the writer of "At Random" has directed strong criticism towards Army psychiatry, he does not seem to have adopted the same attitude towards Captain L'Etang's articles. Captain L'Etang has tried to achieve his criticism by omitting all references to investigations made which did not comfortably fit in with his thesis. For example, though he quotes extensively from the literature, he omits all reference to Professor Lewis's careful follow-up in 1942 of 120 neurotic soldiers discharged to civil life (*Lancet*, 1943). This follow-up showed that many had not recovered their health or become capable of doing useful work. A systematic investigation was then instituted by the Ministry of Health and a larger sample of discharged soldiers followed up. The results confirmed the earlier investigation.*

It is, on occasion, extremely difficult to decide on a psychoneurotic soldier's correct medical category at the time of examination. Captain L'Etang admits that his examination of a patient in 1945 or 1950 may not reveal his mental condition in 1940. Nevertheless, he does attempt to do this, and is not diffident in criticizing recommendations made five or more years previously. It would be a rash psychiatrist who would claim ability to do this.

When considering the incidence and the disabling effects of neurosis in the Army, the evidence one may bring forward on either side is naturally not entirely free from a suspicion of bias. It is fortunate, however, that an impartial statistical survey was made at the end of the last war into the incidence and disabling effect of neurosis in a sample of the civilian working population in England. The Medical Research Council entrusted this to Dr. Russell Fraser, who conducted a systematic investigation into the incidence among workers in light and medium engineering over a period of six months. It was found during that period that 10 per cent. suffered from definite and disabling neurotic illness and that neurotic illness caused between a quarter and a third of all absences from work due to illness.

It also seems a pity that the writer of "At Random" has not stressed to a greater extent the importance of good management in the prevention of psychiatric disorders, whether at the base or at the front. Faulty group morale,

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* *Note.*—Surely this finding backs up one of the points at which the "At Random" was aimed ?—i.e. that in a total war, when the civilian must do some useful work for the nation or be a dead weight to be carried by a probably overburdened civil medical service, every individual should be used to a maximum capacity while he is capable of any type of work for which he is trained regardless of possible or probable eventual breakdown. A reasonably ruthless use of every individual may well become essential. —Ed.

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poor discipline and indifferent training provide a fruitful soil for the development of these disorders. In the last war, different battalions fighting side by side under similar conditions and made up apparently of the same human material often showed startling differences in their incidence of psychiatric casualties. In almost every case of a contrast of this kind it was found that it could be related quite directly to the state of training, discipline and morale. The incidence of psychiatric casualties generally reflects on the quality of unit leadership and on the quality of unit medical care, and therein lies one of the keys to their prevention.

Yours faithfully,
R. ROSIE, *Brigadier*.

THE EDITOR, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

MEDICAL DIRECTORATE,
HEADQUARTERS,
BRITISH ARMY OF THE RHINE,
B.A.O.R. 1.
20*th November*, 1951.

DEAR SIR,

I am delighted to see the letter in the October issue of the Corps Journal, Vol. XCVII, by Major Lewis. I fear that my previous criticism to which he refers may not have been clear, and take this opportunity to explain and answer some of his comments.

1. With regard to the correlation between "illiteracy" and low intelligence, the emphasis is not on the word "correlation" but on "significant." I do not dispute the fact that illiteracy and low intelligence may be found in the same person. Illiteracy is, however, found in those who have average intelligence but who for various reasons have been denied the opportunity of education. In my limited experience I have had no illiterates *per se* referred for psychiatric opinion. Such in the Army are detected by Personnel Selection Officers and given the benefit of education at Primary Education Centres. Those who fail to improve are referred to psychiatrists and the few I have seen were found to be either emotionally or intellectually impaired. This seems to be the experience of other psychiatrists with whom I have discussed this point.

2. In my previous letter I emphasized that the *restricted* employment of men of low intelligence does not endanger hygiene in a unit. There are many duties which men of low intelligence can do in messes, kitchens and cookhouses without actually handling food prepared and cooked for human consumption. The point I wish to emphasize is that if men of low intelligence are eliminated from these jobs, where are they going to be fitted into the Army ? Those employed in cookhouses in the preparation and handling of food are specially examined and passed by the medical officer before employment.

3. Major Lewis supports his contention that there is a correlation between low intelligence and personal hygiene by referring to the fact that outbreaks of gastric and intestinal diseases are commoner in mental institutions. This no one

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will deny, but my remarks did not refer to mental defectives but to men who were able to support themselves and their families in civil life, who had come into the Army to make it a career or to carry out their National Service, and who were not defectives in the technical sense.

It is possible that the incidence of scabies may have been higher in men of low intelligence than in the rest of the community. The point at issue is whether this is a significant correlation and whether all other factors which lead to a lowering of personal hygiene were excluded. I am most interested in his own personal observations in Aldershot District and trust the Journal will be favoured with an article on this subject against a control group in the Army population.

4. I would subscribe to the view with regard to those who show by their behaviour and misconduct an unwillingness to carry out their normal duties in the Service, that the psychiatrist may be a help. The article by Major Lewis may have been misinterpreted by me, but gave me the impression that the role imputed by the psychiatrist was that of getting such invalided out of the Army. This certainly is not the duty of the psychiatrist, who must be entirely objective in his findings. After weighing up all the evidence he may in his "opinion" express the view that the case might be suitable for disposal under K.Rs. 390, section xii, and thus assist the Army authorities regarding this disposal. There are many factors which have to be considered in the "getting rid of such men," not the least of which is the effect on other men in the unit. To discharge any dissatisfied soldier through medical channels without clinical evidence will only bring the medical services into disrepute and lead to a lowering of morale. The disposal of such is an administrative procedure which can be supported by the negative findings of the psychiatrist.

5. Obsessional neurosis is a recognizable psychiatric disability and there is no demonstrable borderline between an "obsessional trait" and actual neurosis. Obsessional traits can be either normal or abnormal. It is the latter that are found in those suffering from obsessional neurosis. The normal obsessional trait causes no worry to the patient. Perhaps I can make my point clearer by referring to the definition of an obsession in the pathological sense as given by Schilder. "An obsession is a content of consciousness which is accompanied by a feeling of compulsion which the individual tries to resist but cannot get rid of, though on quiet reflection he realizes it to be senseless." The important part of the definition is the *element of compulsion* and the *resistance of the patient*, and this serves to distinguish true pathological obsessions from motor stereotypies and autochthonous ideas.

6. I subscribe to the emphasis made by Major Lewis on co-operation between hygienists and psychiatrists. Each has from his special experience a very important function to ensure the promotion and maintenance of good mental and physical health in the Army.

In conclusion I would like to thank Major Lewis for his remarks and regret that I should have caused him any offence.

Yours sincerely,

J. T. ROBINSON, *Lieut.-Colonel.*

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SOUTHAMPTON.
5th November, 1951.

DEAR EDITOR,

On going through the Corps Journal for July, I see the obituary regarding Major F. P. Rankin.

This is incomplete and in case you care to print a short "follow up" I attach a note which you can carve as you wish.

One other point—reference page 148 of the Journal for August. Several Officers, with whom I agree, consider it is bad taste to publish the Estate of Officers in the Journal—it may give a completely false impression. Such items are best left to the popular press.

Yours sincerely,
T. J. L. THOMPSON.

TO THE EDITOR, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS

EDITOR'S NOTE

Thank you, indeed, for the note on Fred Rankin. It is with a mixed feeling of thankfulness and pleasure that we receive any additional notes or information to amplify and clothe the bare bones of an obituary notice. Where we have any personal knowledge, sufficiently intimate, of a deceased member of our Service we give it in the hope that it may help to amplify the bare-boned obituary. But there are many times when we cannot add anything useful. At such times any additional information would be most welcome.

As regards the publication of Estates of Officers, this has already been stopped in deference to a majority opinion canvassed at lunch time in the Central Mess.

ROYAL ARMY MEDICAL COLLEGE,
MILLBANK, LONDON, S.W.1.
9th January, 1952.

DEAR MR. EDITOR,

May I draw your attention to page 497 of the December Journal published today. There is a letter from Major-General Barnsley about the future of the A.M.S. Magazine, which I feel may need an urgent amendment in the January issue of the Journal.

The impression given is that the Journal will cease publication with this number and that the Magazine is then "on its own." Subscribers are asked to place orders separately for the January issue of the Magazine.

Of course, since the Journal is continuing publication for six months from the January number, subscribers to the Journal will still continue to receive the corresponding issues of the Magazine for that period. It is only when the Journal actually dies that the Magazine will—presumably—be a separate publication.

Yours sincerely,
H. W. PECK,
Major, R.A.M.C., Manager.

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Obituary

CAPTAIN GEORGE HENRY FERGUSON BEITH

CAPTAIN G. H. F. BEITH was born in 1920. He was educated at the Royal Colleges in Edinburgh and took the Scottish Conjoint qualification in 1945. In the following year he became house-surgeon and casualty officer at the General Hospital, Nottingham. He entered the R.A.M.C. in May, 1947, as a temporary lieutenant and in the following month was granted a short-service commission. He was promoted captain in May, 1948, and retired from the Service in June, 1950, but was recalled for duty last December.

He has been killed in action in Korea.

B. M. J.

MAJOR F. P. RANKIN
(additional note)

IN the passing of Fred Rankin all in the Corps who knew him have lost a very genuine friend.

Though he retired in 1921 he came back for temporary duty during the difficult years of 1925 and served at the Military Hospital, Maryhill Barracks. Subsequently he left medicine to concentrate on his business interests. Being R.A.R.O., he rejoined in 1939. As D.A.D.M.S., Embarkation, at the Clyde he was most successful ; a better choice for the job could not have been made. His local knowledge, experience and reputation as a Clyde yachtsman and his wide business connections proved most useful.

He was popular with all, a prominent figure in Club life and a good mixer in any company. On occasions he could be thoroughly blunt when the situation demanded. He was a perfect and generous host, as all his pals will endorse. He was always prepared to help those in trouble.

During the latter part of the war he held the rank of local Lieutenant-Colonel.

T. J. L. T.

COLONEL DENNIS AIRD ORR WILSON

As announced in *The Times* of 29th November, 1951, Colonel Dennis Aird Orr Wilson, late R.A.M.C., commanding the 29 British Military Hospital in Hanover, was found dead on a railway track near Hanover on 28th November, 1951.

The son of the late Major-General James Barnett Wilson, late R.A.M.C.,

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retired, *C.B.*, *C.M.G.*, M.D., he was born 1st October, 1905, and took the M.B., Belfast, in 1929. He took the D.P.H., Wales, in 1927.

Commissioned Lieutenant, R.A.M.C., 30th July, 1929, he was promoted Captain 30th January, 1933, Major 30th July, 1939, Lieut.-Colonel 1st August, 1946, and Colonel 22nd August, 1951.

He was Adjutant, later D.A.D.M.S. 53 (Welch) Division, T.A., 1st June, 1936, to 9th May, 1939.

He served in France from September, 1939, to May, 1940, and in North Africa and in Italy from March, 1943, to February, 1944. Mentioned in despatches.

He was awarded the 1939/45, Africa and Italy Stars, the War Medal and was created Officer Legion of Merit (U.S.A.).

J. G. F.

Extracts from the "London Gazette"

2.10.51 *R.A.D.C.*

Admin. & Tech.

Short Serv. Commn.

7536246 W.O. Cl. I. Benjamin Johnson (419667) to be 2nd Lt. 11th Sept., 1951.

2nd Lt. B. Johnson (419167) to be Lt. 11th Sept., 1951.

5.10.51 *R.A.M.C.*

Capt. M. G. Jackson-Smyth, M.B. (291913), to be Maj., 4th Sept., 1951.

Short Serv. Commns.

The undermentioned Lts. to be Capts., 10th Sept., 1951 :

C. R. P. Parry (408679).

R. Catherolle (412968).

H. D. S. Morgan (412975).

H. N. R. Wilson (412984).

Admin. & Tech.

Short Serv. Commn.

Lt. G. C. Smart, *M.B.E.* (375146), to be Capt., 30th July, 1951.

9.10.51 *R.A.M.C.*

Lt. L. Tippett (413208) to be Capt., 1st Oct., 1951.

Capt. (War Subs. Maj.) W. N. S. Donaldson, *T.D.*, M.B. (64906), to be Maj., 28th May, 1946, with seniority 24th Aug., 1947, next above Maj. J. B. Neal. (Substituted for notifn. in *Gazette* (*Supplement*) dated 4th Feb., 1949.)

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Short Serv. Commn.
Capt. Michael Francis Cannell, M.H. (405606), from Emerg. Commn. to be Capt., 15th Aug., 1951, retaining present seniority.
Capt. Anthony Joseph Lewis, M.B. (408528), from Nat. Serv. List to be Capt., 6th Sept., 1951, retaining present seniority.
Capt. Roger Alan Arthur (367484) from T.A. to be Lt., 10th Sept., 1951.
Lt. J. Lamper, M.B. (413222), to be Capt., 1st Oct., 1951.
Lt. K. G. S. Roberts, M.B. (413228), to be Capt., 1st Oct., 1951.

The undermentioned to be Lts., 10th Sept., 1951 :

Ralph George Hirons (418996).
Robert Nöel Evans, M.B. (419035).
Mildred Forsyth Gordon, M.B. (419110).
Colin Henry Corby, M.B. (419146).

Short Serv. Commn.
Admin. & Tech.
Lt. Eric Thompson Bran (309431), from Emerg. Commn. to be Lt., 3rd Sept., 1951, with seniority 1st July, 1951.

Short Serv. Special List Commn.
Louis John Francis Warnants (418714), to be Lt., 10th Sept., 1951.
War Subs. Capt. (now Capt.) John Kenneth Sugden (71654), from R.A.M.C. (T.A.), is granted a Short Serv. Spec. Commn. in the rank of Capt., 22nd Nov., 1946, with seniority 24th April, 1945. (Substituted for notifn. in *Gazette* (*Supplement*) dated 13th Dec., 1946.)

12.10.51 *R.A.M.C.*
Admin. & Tech.
Short Serv. Commn.
War Subs. Lt. (Qr.-Mr.) G. W. Beardsmore (358392), from Emerg. Commn., to be Lt., 17th Sept., 1951, with seniority 21st July, 1948, relinquishing the appt. of Qr.-Mr.

16.10.51 Col. J. W. Hyatt (11808), late R.A.M.C., on completion of four years in the rank is retained on the active list superny. to estab., 16th Oct., 1951.
Lt.-Col. A. N. B. Odbert, *O.B.E.*, M.B. (42438), from R.A.M.C. to be Col. 16th Oct., 1951.

R.A.M.C.
Maj. K. P. Brown, *M.B.E.*, M.B., M.R.C.P. (74435), to be Lt.-Col., 16th Oct., 1951.
Capt. Hugh Edwards Ffoulkes (375834), from Short Serv. Commn., to be Capt., 16th Oct., 1951, retaining present seniority.

19.10.51 *R.A.M.C.*
Capt. Ian McClelland Carmichael (342917), from Short Serv. Commn., to be Capt., 19th Oct., 1951, retaining his present seniority.
Capt. Ernest Aldous-Ball (371398), from Short Serv. Commn., to be Capt. 19th Oct., 1951, with seniority 28th Sept., 1947.
Capt. Eamon Thomas O'Wyer (375048) from Short Serv. Commn., to be Capt., 19th Oct., 1951, retaining his present seniority.

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Short Serv. Commn.

Capt. John Arthur Harland Hancock (407910), from Nat. Serv. List, to be Capt., 24th Aug., 1951, retaining his present seniority.

The King has been graciously pleased to approve that the following be Mentioned, in recognition of gallant and distinguished services in Malaya, during the period 1st January to 30th June, 1951 :

R.A.M.C.

Capt. E. P. White (257770).
7535730 Sgt. C. G. Goves.
21017101 A./Cpl. S. K. Long.

23.10.51 *R.A.M.C.*

Major Andrew Ross Laing, M.B. (150112), from Short Serv. Commn., to be Maj., 23rd Oct., 1951, retaining his present seniority.

26.10.51 *R.A.M.C.*

Capt. (Qr.-Mr.) W. H. Carlton, *M.B.E.* (211652), to be Maj. (Qr.-Mr.), 27th Oct., 1951.
Capt. Eric Godfrey Hardy, M.B. (159529), from Short Serv. Commn., to be Capt., 2nd Oct., 1951, retaining his present seniority.
Capt. (Qr.-Mr.) Alfred Lodge Kennedy (309581), from T.A., to be Capt. (Qr.-Mr.), 17th Sept., 1951, with seniority 2nd Oct., 1950.
Capt. Eric Godfrey Hardy, M.B. (159529), from Emerg. Commn., to be Capt., 1st Oct., 1951, with seniority 11th May, 1947.
Capt. Edgar Hugh Hillyard, B.M. (318043), from T.A., to be Capt., 1st Oct., 1951, with seniority 4th Feb., 1950.
Lt. Edwin Ross Henry, M.B. (417771), from Nat. Serv. List, to be Lt., 15th Aug., 1951, retaining present seniority.

The undermentioned to be Lts., 1st Oct., 1951 :

John Allan Hunt, M.B. (418502).
Sarah Campbell McEwan, M.B. (419036).
Denys Butcher, M.B. (419175).
Peter Samuel Kershaw (419281).
Samuel Stanley Epstein, M.B. (419584).
Robert Murdoch Youngson, M.B. (419587).
Capt. Vincent John Elliott Davies (401512), from Nat. Serv. List, to be Capt., 24th Aug., 1951, retaining present seniority. (Substituted for notifn. in *Gazette* (*Supplement*) dated 21st Sept., 1951.)

Admin. & Tech.
Short Serv. Commn.

Capt. (Qr.-Mr.) Cyril Robert Butler (171365), from R.A.R.O., to be Capt., 1st Oct., 1951, with seniority 9th Jan., 1951, relinquishing the appt. of Qr.-Mr.
Capt. (Qr.-Mr.) Alfred Fletcher Martin (279857), from Emerg. Commn., to be Lt., 1st Oct., 1951, with seniority 12th April, 1947, relinquishing the appt. of Qr.-Mr.

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30.10.51 Col. T. H. Twigg, M.B. (1143), late R.A.M.C., retires on ret. pay, 29th Oct., 1951.

R.A.M.C.
Short Serv. Commn.

Lt. C. Harris, M.B. (413688), to be Capt., 22nd Oct., 1951.

2.11.51 *R.A.M.C.*
Short Serv. Commns.

Lt. Rodney Charles Mitchell, M.B. (417818), from Nat. Serv. List, to be Lt., 20th Aug., 1951, retaining his present seniority.
Lt. Gordon Cumming Wilson, M.B. (413685), from Nat. Serv. List, to be Lt., 5th Oct., 1951, retaining his present seniority.

Type "B"

Major W. S. Angus, M.B. (144179), retires receiving a gratuity, 2nd Oct., 1951.

Short Serv. (Specialist) Commns.

Major D. G. Milne, M.B. (266543), retired having received a gratuity, 29th Oct., 1951.
Capt. (War Subs. Maj.) D. G. Milne, M.B. (266543), to be Maj., 20th Mar., 1951.

6.11.51 *R.A.M.C.*

Capt. (Qr.-Mr.) F. J. Downes (205860), to be Maj. (Qr.-Mr.), 7th Nov., 1951.
Capt. Peter Maynard Bretland, M.B. (375403), from Short Serv. Commn., to be Capt., 6th Nov., 1951, retaining his present seniority.
Capt. Ethelwald Emilius Vella, M.D. (386005), from Short Serv. Commn., to be Capt., 6th Nov., 1951, retaining his present seniority.

Short Serv. Commns.

War Subs. Capt. (Qr.-Mr.) John Henry Hipkiss (270819), from Emerg. Commn., to be Capt. (Qr.-Mr.), 10th Sept., 1951, with seniority 30th April, 1949.
Lt. (Qr.-Mr.) Thomas Henry Hill (366162), from Emerg. Commn., to be Lt. (Qr.-Mr.), 10th Sept., 1951, with seniority 27th June, 1949.
Lt. (Qr.-Mr.) Edgar Alfred Smith (306762) from Emerg. Commn., to be Lt. (Qr.-Mr.), 1st Oct., 1951, with seniority 22nd April, 1947.
Colman Joseph Burke, M.B. (419495), to be Lt., 5th Oct., 1951.

Admin. & Tech.
Short Serv. Commns.

War Subs. Capt. (Qr.-Mr.) Edward Thomas Richard Whittle (342035), from Emerg. Commn., to be Lt., 10th Oct., 1951, with seniority 25th April, 1946, relinquishing the appt. of Qr.-Mr.
Lt. R. O. Cook (356213) to be Capt., 9th June, 1951.
Lt. (Qr.-Mr.) Thomas Price-Adams (282860), from Emerg. Commn., to be Lt., 10th Oct., 1951, with seniority 23rd July, 1948, relinquishing the appt. of Qr.-Mr.

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A *Supplement* to the *London Gazette* has announced the following awards :

First, Second, and Third Clasps to the Territorial Efficiency Decoration.—Major (Honorary Colonel) W. R. Martine, *O.B.E.*, *T.D.*, R.A.M.C.

Second Clasp to the Territorial Efficiency Decoration.—Major J. B. Bishop, *T.D.*, R.A.M.C.

First and Second Clasps to the Territorial Efficiency Decoration.—Lieutenant-Colonel G. T. Hankey, *O.B.E.*, *T.D.*, R.A.M.C.

First Clasp to the Territorial Efficiency Decoration.—Lieutenant-Colonel E. R. Lovell, *T.D.*, R.A.M.C., retired, and Major H. K. Ashworth, *T.D.*, R.A.M.C.

Territorial Efficiency Decoration.—Captains (Honorary Majors) W. G. Mills, R. Murdoch, C. R. Clayburn, D. V. Summers, and Captain A. R. Oliver, R.A.M.C.

26*th November.*—Colonel R. Murphy, late R.A.M.C., has been posted as A.D.M.S., Headquarters East Anglian District, *vice* Lieutenant-Colonel S. W. K. Arundell, who was posted to that appointment on 3rd November and for whom separate orders will now be issued.

Book Reviews

SEROLOGY WITH LIPOID ANTIGEN. By Reuben Kahn, M.S., D.Sc. London: Baillière, Tyndall, & Cox. 1950.

For more than a quarter of a century now the Kahn Test has been widely used for the serological diagnosis of syphilis and in many countries is the sole test employed.

This book is written by the author of the test and contains a full discussion of the principles believed to underly this and other similar tests for syphilis using non-syphilitic lipoid antigens. Though originally such tests were considered specific for syphilis, and "false positives" which occurred were considered to be due to technical errors, it soon became evident that many non-syphilitic sera gave some type of reaction. Kahn and his collaborators have studied this question widely and have concluded that in health and disease breakdown of tissue cells, by normal wear and tear or by some pathological process, liberates lipoid substances of various antigenic types which stimulate the production of auto-antibodies which in turn will react *in vitro* with tissue extracts. The antigenic type of lipoid substance released in syphilitic lesions is specific for syphilis, but sera and tissue extracts may contain antibodies and antigens from other sources which react with each other and thus give rise to "false positives." On this basis are explained the reactions found in yaws, leprosy, malaria, post-vaccinal states and so on. Kahn has investigated such non-specific lipoid antigen-antibody responses in sera from normal and diseased persons and has called these reactions "universal serologic reactions." This term, which smacks of the "Philosopher's Stone," seems an unhappy one,

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implying as it does the possibility of a universal serological test for practically any pathological condition, and some phases such as "non-specific reactions" would be a better choice. In the discussion of the changes in the lipoid antigen-antibody reactions in tuberculosis, he advocates carrying out the elaborate "universal serologic reaction" four times a year on patients in order to judge progress. If a laboratory method is required (but surely the clinician is the better judge), a simple sedimentation rate would give just as much information.

The chapters on the well-known Kahn procedures and on the recognition and interpretation of "false positives" are valuable and could well be read by clinicians as well as pathologists. He exerts admirable restraint on the possibility of determining true from false positives in verification tests and rightly places the onus of decision on the venereologist, particularly as serological tests for syphilis are carried out widely now, not only on patients suspected of having the disease, but as a public health measure pre-maritally and ante-natally.

A. S.

REPORT ON THE ACTIVITIES AND THE MEETING OF THE CO-ORDINATING COMMITTEE ON ABSTRACTING AND INDEXING IN THE MEDICAL AND BIOLOGICAL SCIENCES. U.N.E.S.C.O. No date (U.N.E.S.C.O. publication No. 580). Sales agent: H.M. Stationery Office. Pp. 92 plus three folders (two bound in, one loose). In paper covers, 5s.

The pamphlet gives an account of the origin of the Committee, and of its deliberations and decisions to the end of 1949. Though much of it is occupied with minutiæ of committee work on collaboration in abstracting, in its international bearings and from a publishing angle, much very readable matter remains which may be studied with advantage by editors of, and by those who contribute to, medical and scientific periodicals. Two points may be quoted—that only those abbreviations should be used which are compatible with intelligibility, and that an abstract of a paper should give the title in full, even if it is unnecessarily long, and even if it does not make sense. It is disappointing to read of an editor of a prominent British medical periodical who regards it as an intellectual handicap to be a native of Great Britain.

J. B. N.

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The Editor will be glad to receive original communications upon professional subjects, travel, personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom de plume*.

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Journal
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Original Communications

SOME ASPECTS OF IMMUNITY FOLLOWING INJECTIONS OF TOXOIDS*

BY
H. J. PARISH, M.D., F.R.C.P.E.
Wellcome Research Laboratories

DIPHTHERIA

A SERIES of slides were first shown demonstrating the fall in the incidence of diphtheria in England and Wales following the introduction of the Ministry of Health Immunization Scheme in 1940. From 1911 to 1940 approximately 55,000 notified cases of diphtheria occurred per annum with a mortality which fell steadily to approximately 3,000. In 1942 there were 41,404 notifications with a mortality of 1,827. However, by 1950 the number of cases had fallen dramatically to 980 with a provisional total of 49 deaths. During the last ten years the case-fatality rate had altered but little, and was about 5 per cent. In children under fifteen years of age, 435 cases, with 4 deaths, occurred in 1949 in "immunized" children, but in non-immunized children there were more than twice as many cases and fifteen times as many deaths.

In the ten-year period 1939 to 1949, records of the figures for the number of children immunized under official schemes were kept by the Ministry of Health (these did not include the large percentage of children immunized privately). The percentage immunized of all children under fifteen years increased from 8 to 66. The number of immunizations carried out in 1950, however, decreased compared with the previous year's total (Thomson, 1951). In 1950, and this point was emphasized, only 58 cases of poliomyelitis developed within four weeks of inoculations in a total of 8,000 confirmed cases of poliomyelitis. The injected limb was affected in only 46 of these cases. The risk of poliomyelitis

* Summary of a paper delivered at the Conference of Pathologists held in the Royal Army Medical College on 5th October, 1951.

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following the injection of diphtheria antigens was obviously very small.

It was a matter for concern that the general practitioner of today might find it difficult to recognize a case of diphtheria in its early stages. It was interesting that Sir John Simon wrote, in 1858, "Diphtheria is wellnigh unknown to the existing generation of British medical practitioner," and that Creighton (1891-1894) mentioned that diphtheria *returned* during the years 1858 and 1859.

In the past some authorities had laid down that 70 per cent. of a population must be immune to be assured of protection against epidemic diphtheria. In many countries, however, 40 to 60 per cent. of adults were Schick positive. Dr. Parish deplored the present state of immunity of numerous persons in Great Britain. Owing partly to the increase in the use of artificial immunization and the consequent reduction in the numbers of clinical cases of diphtheria and carriers, the chances of *natural* immunity being acquired by sub-clinical infection were very much reduced. For complete protection, circulating antitoxin associated with a good potential immunity was necessary. A more thorough active immunization campaign was required which should start in infancy. Barr and Glenny (1951) stated that a person "once well immunized is always potentially immune." Dr. Parish condemned active immunization of pregnant women which was carried out in order that the children might acquire a degree of passive immunity; the practice would interfere with immunization schemes in the first year of life.

The Schick test was a poor quantitative indicator of the amount of circulating antitoxin present, and Schick conversion rates two months after immunization set too low a standard. For fundamental research, blood samples were essential, but there was also a definite need for improvement in the toxin used for the Schick test, a difficult research problem.

The diphtheria prophylactics available were next reviewed. Alum precipitated toxoid (A.P.T.) was the prophylactic most used in Great Britain. When properly prepared, it gave uniform results and was extremely effective. Two injections of 0.5 ml. spaced by an interval of at least four weeks should be given to young children, as doses of 0.1 or 0.3 ml. produced a lower and less durable immunity. Barr, Glenny and Randall (1949 and 1950) have shown that the antitoxin titre in cord blood tended to be higher than that in the mother's blood; at ten days the circulating titre of the infant's blood averaged half that of cord blood; the loss of half the antibody remaining at any date took about four and a half weeks. Young babies whose blood contained less than 0.04 of a unit of antitoxin per ml. could be successfully immunized. These authors suggested immunization of infants with A.P.T. at three, six and eighteen months. In general, the larger the dose used, the less the possible interference from maternal antitoxin and the better the response. In younger and lighter babies more antigen was being injected per kilo., a point in favour of early immunization.

Toxoid antitoxin floccules (T.A.F.) was a milder antigen and produced a weaker response than A.P.T. This prophylactic was given in three doses of 1 ml. and was more suitable for older children and adults.

Holt's work, on Purified toxoid, aluminium phosphate precipitated (P.T.A.P.), was first published in 1947. This prophylactic was a more potent prima

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stimulus than A.P.T. ; as an antigen it was relatively pure. It was still, however, in the experimental stage, and was undergoing extensive clinical trials. Diphtheria purified formol toxoid (F.T.) has been prepared. The subject of diphtheria antigens is more complex than was realized ; Pope, Stevens, Caspary and Fenton (1951) demonstrated many different antigens in so-called "pure" preparations.

Barr and Glenny (1951) suggested that a precipitated or adsorbed prophylactic might be the ideal antigen for a primary course, and that purified toxoid could be used later in life. The allergic reactions described following the use of purified toxoid (Pappenheimer and Lawrence, 1948) again emphasized the need for immunization in early life when the injections were usually trouble-free. Barr and Parish (1950) had injected themselves intradermally with purified toxoid and developed allergic reactions ; the intradermal route was unsatisfactory. Finally, Dr. Parish drew attention to the increasing importance of booster doses in any immunization programme.

TETANUS

Dr. Parish quoted figures for the United States Army, Japanese Army and the British Army. The U.S. Army in World War II had 12 cases of tetanus, 4 of which occurred in fully immunized personnel, a rate of 0.44 per 100,000 wounded, which compared with an incidence of 13.4 per 100,000 wounded in World War I. The Japanese Army followed no official scheme : the figures available suggested that their incidence of tetanus in World War II was 10 per 100,000 wounded. In the British Army, who were immunized with toxoid and received antitoxin after wounding, there were 22 cases in World War II, of whom 11 died. Press (1948) analysed 982 cases in connection with the civil use of toxoid in peace time. The difficulty of this problem was amply shown by the fact that 15 per cent. of the cases of tetanus followed a "trivial" injury and 34.5 per cent. occurred where the cause and nature of injury was "unknown." The use of antitoxin in prophylaxis was associated with the risk of allergy. However, the toxoid used in England had been trouble-free since Witte peptone had been excluded. Tetanus was not a great problem in England, there being only approximately six deaths per million per annum.

There was a strong case for combining toxoid with other prophylactics ; combined prophylactics reduced the number of injections required. The dosage of tetanus toxoid used in Great Britain was compared with that in the U.S.A. : in the latter, three doses of 1.0 ml. of fluid toxoid were spaced by periods of three to four weeks. There was, however, now a preference for the use of alum precipitated toxoid in the U.S.A.

Active immunization against tetanus was simpler than that against diphtheria, at any rate in adults ; higher titres occurred after the primary course of three injections, and frequent booster doses could be given with a negligible risk of reactions. The question whether wounded men should receive antitoxin or toxoid or both was now the subject of investigation in the British Army.

Tetanus was not an immunizing disease in man, and large doses of antitoxin were required in its treatment. Natural antibodies could never be demonstrated in human serum, and patients could suffer multiple attacks, possibly with a fatal

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outcome. Artificial immunization, of course, made possible the introduction into the body of larger doses of antigen than occurred in the natural disease; that was why it succeeded where the disease itself failed to immunize.

Other Infections

Dr. Parish mentioned briefly the promising nature of early work on combined tetanus and gas gangrene toxoids, but much further research was necessary. Tetanus toxoid could also be associated with T.A.B. vaccine (T.A.B.T.), and with diphtheria prophylactic and whooping cough vaccine. Botulinum toxoids, he stated, were used for the immunization of horses, etc.; the different types of *Cl. botulinum* produced different toxins. Staphylococcus toxoid had a definite use in conjunction with chemotherapy in the treatment of recurrent superficial skin lesions and was probably more useful than vaccine therapy. Up to 70 per cent. successes had been claimed for this method. Macdonald and Taylor (1951) had recently reported 60 per cent. of cases of pustular acne improved after six months, while only 16 per cent. of controls showed improvement. Immunity was, however, short-lived.

Dr. Parish concluded with a reference to Grasset's "endotoxoid" T.A.B. vaccine, where the bacteria were killed with heat, disrupted by alternate freezing and thawing, and then formolized. While further research was indicated before this vaccine was adopted for more general use, the published figures were impressive (Grasset, 1951).

General Discussion

In reply to a question on the age at which children should receive boosting doses of diphtheria prophylactic, Dr. Parish said that the Ministry of Health recommended re-injections at four to five years, at the time of entry to school, and again at the age of nine to ten years. Some doctors were now giving a first boosting dose at eighteen months, or a little later. One advantage of giving injections in the early years of life was the rarity of severe reactions.

In answer to another question in connection with diphtheria prophylaxis and poliomyelitis, Dr. Parish thought it might be advisable to withhold injections during periods of epidemic prevalence of poliomyelitis.

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REPORT ON THE INCIDENCE OF EPIDERMOPHYTOSIS OF FEET IN 1,050 ARMY PERSONNEL, AND A COMPARISON OF DIFFERENT LINES OF TREATMENT

BY

Captain A. J. DAVIES

Royal Army Medical Corps

THE problem of fungus infection of the feet in the Army is one of prime importance. The incidence of epidermophytosis is higher than in civilian life, but this is not altogether unexpected, for the communal use of bath rooms, towels and even socks, coupled with excessive sweating and minor trauma to feet induced by boots and long marches, are ideal for the spread of these infections.

It has been shown statistically that this high incidence leads to a definite man-power wastage, which, in time of war, may be ill afforded. This is well illustrated by the Bulletin of Army Health, which shows that in the Middle East in 1943-44 there was the following wastage :

TABLE I.—SHOWING CASES OF FUNGUS INFECTION /100 MEN, WITH DURATION, IN DAYS, OF TREATMENT

Total Cases of all Fungus Infection /100				Cases of Fungus Infection of feet only /100				Duration in Hospital and/or Depot in Days	
1943		1944		1943		1944		1943	1944
O.Rs.	Officers	O.Rs.	Officers	O.Rs.	Officers	O.Rs.	Officers		
1.00	.88	.63	.68	.61	.70	.37	.44	25.7	33.0

There have, at various times, been surveys into the incidence of epidermophytosis of feet, mostly in the U.S.A., where it has been estimated that from 50 to 90 per cent. of the total population are infected. Examining a series of 100 University Students, Hulsey and Jordan found that there was a clinical incidence of 67 per cent. of tinea pedis. At the University of Pennsylvania Gilman found 145 out of 390, an incidence of 37 per cent., and later, examining another 500 students, he found that 60 per cent. had clinical evidence of fungus infection. Further studies produced by Muskatblit on 112 medical students and 100 hospital patients gave a total of 89 per cent. infected. Prehn found that of 1,500 men in the U.S. Navy 88 per cent. had mycotic infection of the feet.

It was decided at the Army School of Health to compare the American figures with a similar cross-section in this country. In view of the findings of Legge, Bonar, and Templeton, who showed that on entering university life the incidence of tinea pedis in a group of 3,100 students was 53.3 per cent., but at the

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end of the first term, that is three months later, this number had risen to 78.6 per cent., a similar approach was proposed. In this, recruits would be examined on first entry into the Army, and these would be compared with troops of six months' to six years' service, who had served under approximately the same conditions. Ideally the recruits should have been examined again at the end of their basic training, but it was not possible to arrange this. The simple division into infected and non-infected was thought to be inadequate as the severity of the infection was of importance, particularly when comparing treatment.

A classification was devised as outlined in the preliminary communication, which divided the degree of fungus infection on clinical grounds into four grades.

Nil.—No obvious signs of fungus infection, no cracking between the toes or gross scaling. On microscopic examination of scrapings there was no evidence of fungus. Cultural methods were not used.

Minimal or Slight.—Here there was scaling or cracking between the toes, the skin having the appearance of blotting paper. The extent of infection was confined to one, or at the most two, interdigital spaces. It was noted that the 4th-5th interdigital space was by far the most commonly affected. It was possible in a selection of cases to demonstrate the fungus microscopically.

Moderate.—In this grade there was scaling and cracking with sodden skin between all toes of both feet. In some cases the skin of the interdigital space was denuded and the patients complained of sore feet. One case had a moderate infection confined to one foot, the other being completely clear. The fungus was confirmed microscopically in the affected foot, but not at any time in the other.

Severe.—In this type the infected area was spreading up on the sole of the foot. The patients complained of itching, smarting and sometimes of the smell of their feet. The fungus was usually profuse microscopically, but, however, in a few cases it was not possible to demonstrate any fungus.

In order to get a background of each case, a small questionnaire was prepared, asking civil occupation, any previous history of foot trouble, and length of service. At the time of examination each person was asked if their feet sweated excessively.

During the months of May, June and July, 1,050 men were examined, and then subdivided into three service groups :

(1) Recruits with no service ... ... 287 examined
(2) 6-18 months' service ... ... 354 examined
(3) 1½-6 years' service ... ... 409 examined

Results

Table II.—Showing Number of Infected and Non-infected in the Total Group Examined

No. Examined	*No. with Infection*	*No. with no Infection*
1,050	645	405
100%	61%	39%

645, or 61 per cent. of the total number examined, 1,050, had clinical fungus infection. This number on further examination can be divided into three degrees of infection, as outlined above.

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Table III.—Showing the Division of Infected Cases into three Grades of Severity

Total Examined	*No. Infected*	1	2	3
1,050	645	395	152	98
100%	61%	37.6%	14.4%	9%

The cases examined can now be considered in three main service groups.

Group (1). 0 *service*

Table IV.—Showing the Numbers of Infected and Non-infected in Recruits with 0 Service

No. Examined	0	1	2	3
287	192	63	22	10
100%	67%	22%	7.5%	3.5%

The people in these groups have not been exposed to the risks of infection associated with service life, and so only 33 per cent. are infected.

Group (2). 6-18 *months' service*

Table V.—Showing Numbers of Infected and Non-infected in Troops with 6-18 Months' Service

No. Examined	0	1	2	3
354	84	112	97	61
100%	24%	31.5%	27.5%	17%

Group (3). 1½ -6 *years' service*

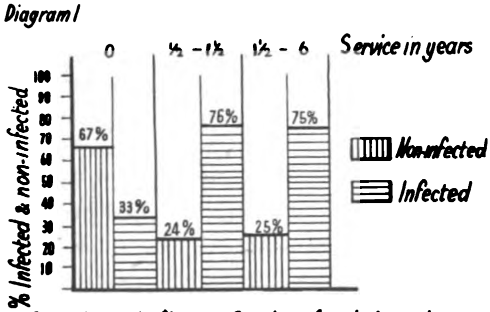
Table VI.—Showing Numbers of Infected and Non-infected in Troops with 1½-6 Years' Service

No. Examined	0	1	2	3
409	104	194	61	50
100%	25%	47.5%	14.5%	12%

There is a very great increase in the number infected, from 33 per cent. on entry in the Army to 76 per cent. after 6 months' service and 74 per cent. up to 6 years. These figures show that the critical period, as would be expected, is in the first few months, but that there is no increase in the figures after that time with the longer service group.

The difference between these groups can be shown to more advantage graphically.

Diagram I



Comparing the % non-infected - infected in each service group

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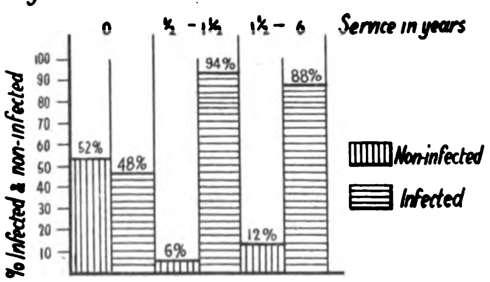
It is known that the epidermophytosis is associated to a marked degree with hyperhidrosis and it has been possible to corroborate this with figures from the present survey. At the time of foot examination each man was asked whether his feet sweated excessively. Of the 1,050 men examined, 429 stated that their feet sweated excessively, and of these 337 had fungus infection, that is 78.5 per cent. of 429. If each of the service groups is again examined the distribution is seen to be as follows :

TABLE VII.—COMPARING THE DISTRIBUTION IN SERVICE GROUPS OF THE PEOPLE SUFFERING FROM HYPERHIDROSIS AND INCIDENCE OF INFECTED AND NON-INFECTED FEET

Groups	*Total in each Group*	*No. with sweaty feet*	*No. infected*	*No. non-infected*
0	287	121	57	64
½-1½	354	133	125	8
1½-6	409	165	145	20

Again graphically the results were seen to more advantage.

Diagram 2



Showing distribution in three service groups of infected and non-infected feet, considering only those with hyperhidrosis

If Diagrams 1 and 2 are compared, then the higher incidence of mycotic infection of the feet in those complaining of hyperhidrosis is at once obvious.

One was rather surprised to find that some people with severe infection of the feet were not aware that there was anything pathologically wrong with their feet. Of the 1,050 people examined, only 214 gave a history of previous foot trouble or had noticed any evidence of fungus infection at the time—that is less than 20 per cent.—and of these all but 11 had some degree of athlete's foot. This is surely an indication of the lack of education in personal hygiene, which is to a certain extent excusable in recruits, but certainly not in men who have completed their basic training.

The occupations of the individuals were studied prior to entry into the Army by dividing them into skilled, semi-skilled, and unskilled groups. The figures produced showed perhaps a slightly lower incidence in the skilled group, but the common risks shared in the Army have obscured any particular occupational hazard that there may have been.

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Treatment

The chief danger in the treatment of fungus infection of the feet, as with all skin diseases, is over treatment. As an introduction to the results, a brief outline of the types of treatment available will be given.

Treatment should be carried out under two main headings :

(1) Topical treatment.
(2) Prophylactic treatment of the infected and the non-infected cases.

Topical treatment

There are three main types of application that may be used.

1. Keratolytics.
2. Soothing agents.
3. Fungicides.

1. *Keratolytics* are used with the idea of removing the superficial layers of the skin where fungus is found. Usually it is better to use them as a prelude to the use of the stronger fungicides, giving them greater access to the fungus.

Those in common use are salicylic acid and resorcinol. The former is most commonly favoured as it has a more gentle action and does not irritate the skin. The strength used is 2 per cent., but it has been recommended that a 6 per cent. solution between the toes be used, and Satenstein recommends a 30 per cent. solution, but this does, however, seem a little drastic.

Recently a mixture of phenol and camphor has been used, but its use is not advocated as there is danger of local necrosis. If it should be used, only under the strictest supervision, the patient is kept in bed and no water allowed on the feet.

2. *Soothing agents* should be used when there is any degree of acute inflammation present. Those that have been used to date are :

1. Two per cent. aqueous solution of gentian violet t.d.s.
2. Bathing areas b.d. with 1/1000 potassium permanganate.

It is, however, no use applying these agents and allowing that patient to remain ambulant ; he should be put to bed for two to three days. It has been found that more rapid drying is attained if the feet are exposed to the air.

3. *Fungicides.*—(*a*) The most popular is *Whitfield's ointment*, which consists of :

Benzoic Acid	5 per cent.
Salicylic Acid	3 per cent.
Paraffin Wax	25 per cent.

(*b*) *Iodine and chlorine* have been found to be powerful fungicides. They have, however, an irritant action. Iodine can be used in the form of a bland ointment, Iodi Denigrescens.

Iodine	5 per cent.
Arachis Oil	15 per cent.
Yellow soft Paraffin	80 per cent.

Chlorine is used in sodium hypochlorite or bleaching powder.

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(*c*) *Gentian violet and brilliant green* are both fungistatic, but only mildly fungicidal. Of the two, brilliant green is the more powerful.

(*d*) *Castellani devised a paint* which is of great use, but is apt to cause some skin irritation and should not be used in inflamed areas.

Magenta	0.4 per cent.
Phenol	4 per cent.
Boric Acid	0.8 per cent.
Resorcinal	8 per cent.
Acetone	4 per cent.
Meth. Spirit	8 per cent.
Aqua ad	to 100 per cent.

(*e*) Recently work has shown that the salts of the fatty acid, *Undecylenic acid*, are powerfully fungicidal. This substance is the basis of many of the proprietary brands of fungicide. As, however, it is not available to the M.Os. without a specialist prescription this substance was not used.

(*f*) *Mercurials* are useful, particularly phenol mercuric nitrate, which is a good fungicide and, in ointment, non-irritant.

Although over 1,000 people were examined it was only possible to obtain 47 cases for treatment. Of these 5 were severe cases and 42 moderate infections.

It was decided to follow the line of treatment suggested in the *Army Medical Dept. Bulletin* of January, 1943.

The 5 severe cases were put to bed, and the feet bathed twice a day for five minutes with 1/1000 potassium permanganate. In order to promote rapid drying the feet were left exposed to the air. After three days it was found that much of the soreness had gone with the subsiding inflammation, and it was possible to treat these cases, as the remaining 42 were treated, by one of four methods.

1. Whitfield's ointment b.d.
2. Castellani's paint b.d.
3. Dithranol ointment 1 per cent. b.d.
4. Brilliant green b.d.

These four methods were compared as to :

(*a*) Rapidity of clearing infection.
(*b*) Recurrence rate at end of six weeks.
(*c*) Production of skin reaction, e.g. irritation.

TABLE VIII.—COMPARING TREATMENTS

Treatment used	*No. Treated*	*Duration of treatment in days*	*Recurrence*	*Reaction*
Whitfield's Ung.	16	20	5	0
Castellani's Paint	14	17	2	2 (slight)
Dithranol Ung. 1% ...	9	14	0	3 (1 severe)
Brilliant Green	8	35	6	0

It can be seen that most effective was ung. dithranol average treatment time being fourteen days with no occurrences at the end of six weeks ; the poorest

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being brilliant green, requiring an average treatment time of thirty-five days, with a recurrence rate of 6 (75 per cent.).

It was observed that even after the eruption has disappeared clinically, if the treatment was stopped then there was recurrence. This was seen particularly with Whitfield's ointment; when three cases were stopped treatment after ten days when there was apparent cure, all three recurred within six weeks.

Prophylactic Treatment

There is little use treating the mycotic infection of the feet if no attempt is made to prevent re-infection.

Of Infected People.—The cases under treatment were isolated, in that they slept in a room in the Medical Centre, bathing in a bathroom reserved for their use. They were supervised in the daily preparation of feet, and washing socks each night.

Their boots were stored each night and exposed to formalin vapour. At the week-end their boots were swabbed out with 10 per cent. formalin. In spite of the liberal use of formalin, only one reaction was obtained, and this only a mild erythema. The bath was scrubbed with 10 per cent. formalin and the duckboard scrubbed with bleaching powder, and at every available opportunity it was scrubbed and put out in the sun to dry. These troops carried out their normal duties, being required to attend for a foot inspection every second day.

Theoretically the cases should only have been allowed to return to their barrack rooms if there was no sign of re-infection at the end of six weeks. In actual practice this was not possible, and if at the end of a week following cessation of treatment there was no recurrence then they were permitted to move back. They were, however, watched and their feet inspected once a week.

It was made a rule that if anyone reported with foot infection or was found at an N.C.Os.' parade, then all members of this barrack room were inspected; one was able to "pick up" several cases that way.

Of Uninfected People.—Strict rules were laid down prohibiting the sharing of socks and shoes and of running about in bare feet. The reasons for this were explained, and then anyone found breaking these rules was strictly dealt with. Frequent foot parades were held by N.C.Os. and this ultimately will lower the incidence of dirty feet, which favours the development of the fungus.

Troops were encouraged to bathe daily or at least wash their feet and change their socks. The bath tubs and duckboards received the same treatment as above. Following bathing, foot powder was applied, either ordinary talc, or one containing fungicide and keratolitic such as 1 per cent. thymol and 2 per cent. salycylic acid.

It is only by taking the strictest measures and adequate education of troops that the incidence of this disease will be reduced.

Summary

A series of 1,050 feet were examined for epidermophytosis and a comparison of the results using four different types of treatment.

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I should like to thank the Commandant, Army School of Health, Colonel H. E. Knott, O.B.E., and the Senior Instructor, Lieut.-Colonel T. M. W. D'Arcy, for their helpful criticisms and advice in preparing this article.

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REQUIREMENTS OF A MILITARY HOSPITAL

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[*Continued from page* 32, *January issue*]

PART II—IN-PATIENT DEPARTMENTS

Ward Design

It is the present trend in hospital administration and staffing that a nursing unit should consist of about 25 to 30 beds, including a proportion of single rooms. The figure is a variable one in civil practice, depending on the nature of the ward concerned and types of case expected to be nursed there. A 25-bed unit, including three or four single rooms, is about the maximum desirable in a military hospital since there is available per nursing unit only one trained sister who has to supervise up to not more than about six untrained and semi-trained nursing assistants.

The design of wards has been discussed fairly exhaustively by various people in many countries and the types generally recognized are—

(*a*) The large pavilion type ward.
(*b*) The small ward.
(*c*) The large veranda type ward.

The Pavilion Type

(*a*) This is the type commonly found in military hospitals and in most "old-fashioned" civil hospitals. It consists of a long ward with the beds ranged down its sides, heads against the wall, feet towards the middle; the ward is lighted by long windows spaced between the beds, and cross-ventilation is simply and easily achieved. Ventilation is always ensured by the fact that the windows on the side of the ward protected from the prevailing weather can be opened without risk of exposure of the patients. Supervision of the ward is easy and simplicity of planning is another advantage.

(*b*) The disadvantages are that the patients face the light; it is not always easy to arrange ventilation to suit each patient's needs; and some patients tend to feel lost in such a large group—a feeling of being in a "public institution" or "infirmary" tends to be engendered and is often resented by the patient.

The Small Ward

The small ward first became widely used in the late 1920's in Scandinavia and later in the United States. The large pavilion type was practically

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abandoned in any of their hospitals planned and built after 1930. The small ward trend has been followed in certain hospitals in this country; the tendency generally has been towards separate 4-bed wards. Examples of the small 4-bed ward layout may be seen in the Royal Masonic Hospital, London.

The reason that the tendency was chiefly towards a 4-bed unit was because this gave each patient his own corner position in the ward and also the shape and size of the room was convenient from the design and building aspect.

The principal advantages claimed for small wards were:

(*a*) They provided quiet and privacy for patients.
(*b*) They afforded opportunity for the segregation of patients within a ward.
(*c*) They limited the spread of cross infection.
(*d*) They facilitated periodic cleaning and redecoration.
(*e*) They afforded a small social unit for patients—that is to say, a patient would feel on more intimate terms with one, two, three or other small number of immediate neighbours: he did not get the feeling of being lost in a large number of anonymous personalities.

The disadvantages were:

(*a*) They increased the amount of supervision required so that more nurse time per patient was necessary. They also increased the amount of supervision of the nursing staff required for the sister in charge of the ward.
(*b*) They did not lend themselves so readily to adequate ventilation.
(*c*) They increased the cost of building and they complicated planning of wards and the hospital as a whole.

The Veranda Type

A compromise on these alternatives was developed in this country by the introduction in the early thirties by Elcock and Sutcliffe (1934) of the so-called "veranda" wards at the Hertford County Hospital. This type of ward is a version of what is known as the Rigs Ward in America and on the European Continent and which is named after the Rigs Hospital at Copenhagen, where it was apparently first used. It consists of a long ward divided into bays, each bay containing 2, 4 or 6 beds, according to the width of the ward.

In the original Rigs ward an open corridor giving on to the bays runs down the centre of the ward. In the veranda ward this corridor runs along one side of the ward and the other side wall consists of the windows, which may or may not give on to a balcony. The beds are lined lengthwise in the ward with the beds in each bay facing each other. The advantages and disadvantages of the veranda ward are similar in kind to those for the small wards, but vary somewhat in degree. A compromise is produced which retains almost the full advantages quoted above of the small ward and either entirely avoids or considerably reduces the disadvantages.

Examples of pavilion, Rigs and veranda types of wards are shown at Fig. 4.

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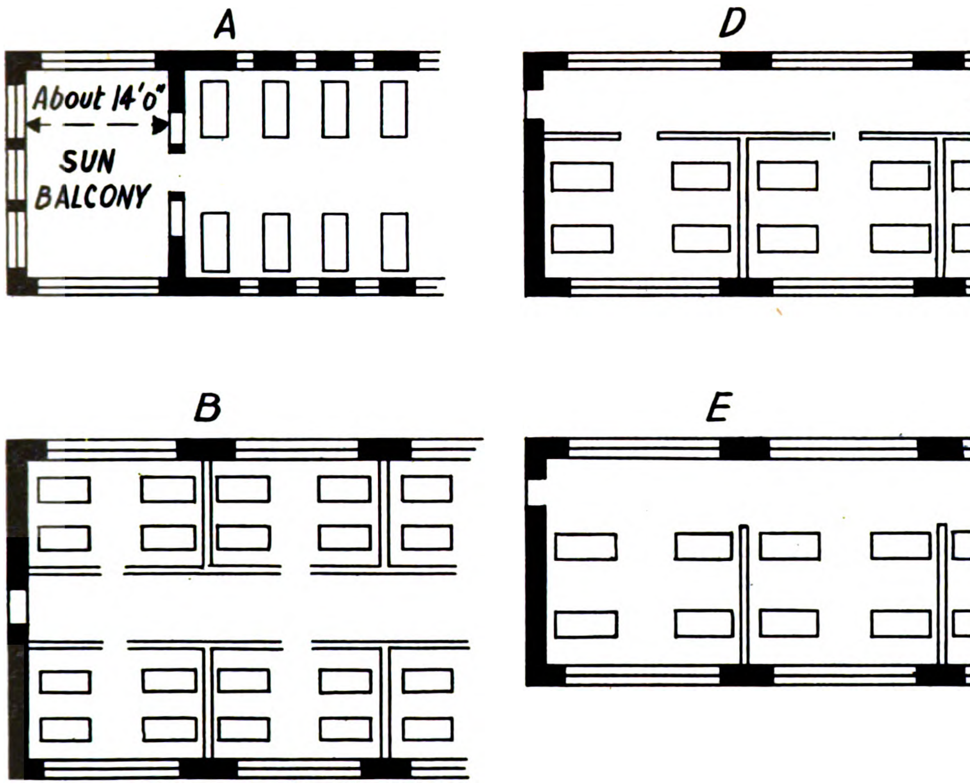

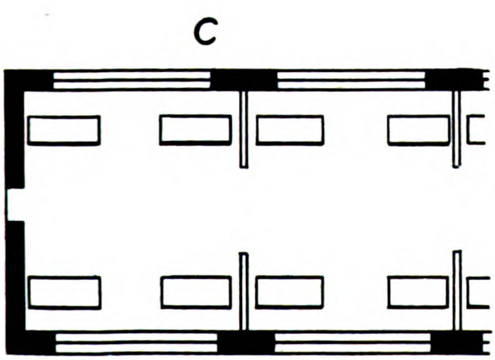

A—Pavilion Type.
B—Variety of Rigs Type.
C—Variety of Rigs Type.
D—Veranda Type.
E—Veranda Type.

The new Princess Victoria Ward at Q.A. Military Hospital, Millbank, is an example of C.

FIG. 4.—COMMON WARD TYPES.

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The type that is to be preferred for a military hospital is not necessarily that best suited to civil hospitals. The young soldier is gregarious in most of his activities in barracks and as a rule tends to feel lonely if isolated. It is doubtful whether the advantage of privacy quoted above, which refers to civilian hospitals, applies in the case of young soldiers. Generally speaking, most soldiers find solitude wearisome and depressing and they will often prefer to be in a ward with twelve or more comrades, where they can "muck-in" with the others and enjoy conversation, play games, and make visits to each other's bedsides. The proportion who wish to be alone is small and these can be catered for in the single-bed wards, which have to be provided for patients requiring separate accommodation because they are severely ill, or noisy, or require observation quite apart from their fellows. On balance, therefore, the pavilion type of ward comprising about 20 beds with about 5 single-bed wards added is the type generally to be preferred for other rank wards. There is also a place for a certain number of veranda type wards, divided into 2-bed and 4-bed bays, for the T.B., V.D., E.N.T. and Eye wards, officers' wards and women's wards, to whose needs they are admirably suited.

Cret (1950) states that in designing the U.S. Naval Hospital, Beaufort (the latest American designed service hospital), the pavilion type wards were the outcome of the specific preference of the U.S. Navy Department.

Balconies and verandas must not be less than 9 feet wide, to permit easy turning of beds. They serve little purpose in the veranda type wards, but are valuable in pavilion wards where day rooms or solaria for each ward are not provided. Their usefulness in tropical climates in providing shade and in the prevention of solar heating of walls of the wards underneath should not be overlooked.

Ward Ancillaries

The ward ancillaries required should comprise :

- (*a*) Sluice room.
- (*b*) Patients' lavatories comprising—
  - (i) Lavatory basins.
  - (ii) W.Cs. (urinals are out of date in wards and should only be provided in out-patients' departments, etc.)
- (*c*) Bath and showers.
- (*d*) Sister's duty room and lavatory.
- (*e*) Ward servery.
- (*f*) Medical Officer's consulting room and office.
- (*g*) Treatment room with sterilization bay.
- (*h*) Clean and dirty linen stores.
- (*j*) Housemaids' store.
- (*k*) Small ward store.

It is felt preferable to centralize the storage of such items as splints, bed rests, cradles, fracture boards, etc., in the hospital store, but it is essential that a *small* number of such items such as bed rests, splints, cradles, be held in the

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ward and provision for these should be made in the small ward store. Certain wards require additional ancillary accommodation—e.g. in the V.D., families', skin, psychiatric units (*q.v.*). Dining and recreation accommodation will have to be provided in the officers' and families' wards (*q.v.*). Slight modifications to the standard ward plan may be needed to accommodate these.

The relative positioning of the sister's duty room, the servery and the sluice can give rise to much discussion, but, on balance, it is probably best that the sister's duty room be adjacent to the main ward itself. The sluice room and the patients' lavatories should also be adjacent to the ward, but the interposition of a small lobby is desirable.

A circulation diagram is at Fig. 5.

1. Duty Room.
2. } Single Bed Wards.
3. }
4. Ward.
5. Treatment Room.
6. Sterilizing.
7. M.O.'s Room.
8. Sluice.
9. Dirty Linen.
10. Bath and Showers.
11. W.Cs.
12. Toilets.
13. Servery.
14. Clean Linen.
15. Ward Store.
16. Day Room.

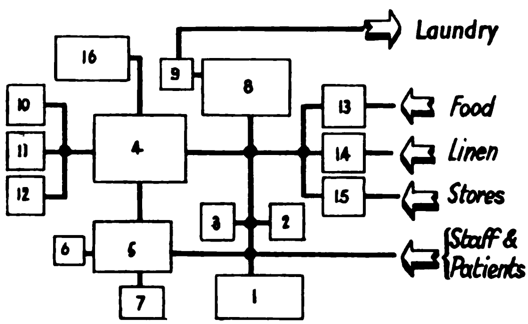

Fig. 5.—Ward Unit.

Staff lavatories

Orderlies' lavatories should be provided on the basis of one per two or three wards. They need not be in the ward annexes at all, but placed at convenient points in the corridors between the wards whose staff they are intended to serve. One M.O.'s and one sister's lavatory per floor or wing should be sufficient, apart from those provided in the special departments, administrative wing, operating theatre suite, and so on.

In-Patient Nursing Units for Special Departments

Women and Children's Unit

(*a*) The requirement for a women's and children's unit is best provided as—

(i) Women's medical and surgical wards—a number of 4-bed-bay veranda type wards as required, with a somewhat higher proportion of single rooms than is usual in ordinary wards.

(ii) Children's wards of the veranda type with a small isolation ward or cubicle providing for beds and cots.

(iii) Maternity wing comprising preparation room, lying-in ward, delivery room with separate sluice room and sterilization room; lavatories, bathrooms, etc.

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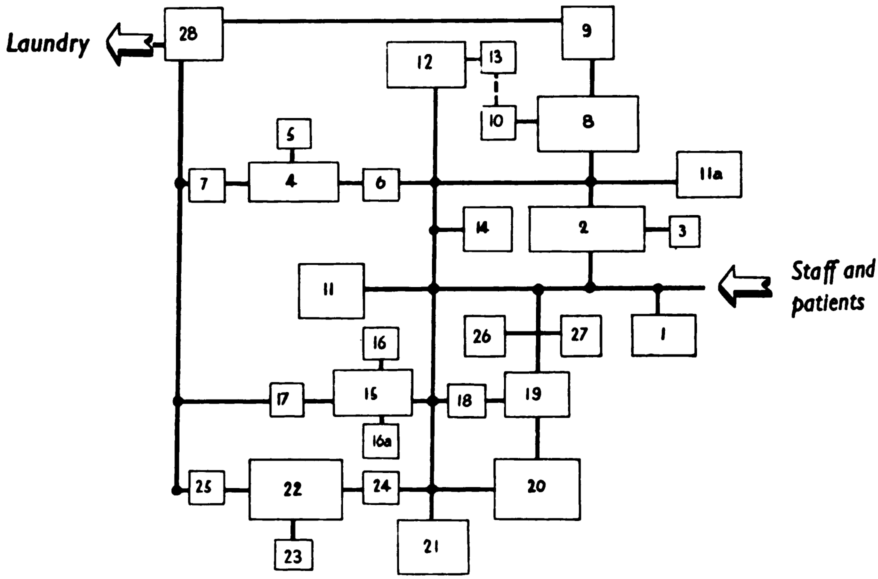
(iv) Infants' nursery with proper baths and an isolation cubicle, and a milk room in addition to the ward servery.

(v) The normal ward ancillaries plus a sitting room, dining room and sometimes an extra servery to serve them.



1. Waiting for Visitors.
2. Delivery Preparation.
3. Delivery Preparation, W.C.
4. Pre-natal Ward.
5. Pre-natal Ward, W.Cs., Bath, etc.
6. Pre-natal Ward, Single Rooms.
7. Pre-natal Ward, Sluice.
8. Delivery Room.
9. Delivery Room, Sluice.
10. Delivery Room, Sterilizing.
11. Sister's Duty Room.
11*a*. Additional Midwives Duty Room (if required).
12. Treatment Room.
13. Treatment Room, Sterilizing.
14. M.O.'s Room.
15. Infants' Nursery.
16. Infants' Nursery, Isolation Cubicle.
16*a*. Premature Infant Unit (if required).
17. Infants' Nursery, Baths and Sluice.
18. Infants' Nursery, Milk Kitchen.
19. Servery.
20. Dining Room.
21. Day Room.
22. Post-natal Wards.
23. Post-natal Wards, W.Cs., Baths, etc.
24. Post-natal Wards, Single Rooms.
25. Post-natal Wards, Sluice.
26. Store.
27. Clean Linen.
28. Dirty Linen.

FIG. 6.—MATERNITY UNIT.

(*b*) The whole delivery suite and infants' nursery of the maternity unit should be air-conditioned in tropical climates.

(*c*) The planning of maternity and other women's ward accommodation in such a way that it is flexible is most desirable. The maternity section might be required to expand at some future date and the women's wards should be so laid out as to make any part or all of them suitable for this.

(*d*) The circulation diagram for a maternity unit is at Fig. 6.

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Officers' Unit

Sitting room, dining room and recreation room accommodation has to be provided in the ward ancillaries in addition to the normal scale. A number of small wards (4-8 beds) and a high proportion of single rooms should form the nursing unit.

E.N.T. Unit

Beyond a requirement to segregate clean from dirty cases, there are no special needs in these wards. The veranda type of ward should be preferred since it allows better segregation of the cases. The normal proportion of single rooms should be adequate.

Ophthalmic Unit

The considerations here are the same as for E.N.T. wards. Facilities for shading windows by use of venetian blinds are an extra requirement beyond what is needed for the ordinary wards. Otherwise the normal veranda type ward is suitable.

Skin Unit

There should be no need for the special provision of additional treatment rooms for the skin wards unless out-patients are to be dealt with in the in-patient wards or departments. Where this is not the intention in a particular hospital, nothing additional need be included except possibly an extra bathroom. As neither trained personnel nor equipment are yet generally authorized for provision of superficial X-ray therapy in military hospitals, no provision has to be made at present for accommodation for this purpose. When the time comes such provision is probably better made in the out-patient department.

S.U.S. (Detention) Unit

Soldiers under sentence or close arrest who are seriously ill should be nursed in the general wards—under guard if necessary. For cases of minor illness a small detention ward can be provided. This will require an annexe to accommodate a guardroom (for a maximum of about 1 N.C.O. and 10 O.Rs.), a servery, a treatment room and its own lavatories and bathroom. It is convenient to site it so that it can be very closely connected to some other nursing unit for proper supervision of the nursing, which may otherwise deteriorate in standard.

T.B. Unit

Beyond specifying that these wards need to be provided with a good proportion of single rooms, good access to one of the clinical side rooms and that the veranda type should be chosen, there is no special requirement for the ward itself. The sanitary annexe should be provided with a small destructor (gas or oil burning) and facilities for sterilization of crockery and sputum mugs are essential.

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Isolation Unit

Essential segregation is most economically provided by using veranda type wards with single-bed bays and single rooms. A small destructor is essential for destruction of infected waste; bed pan and crockery sterilization should be provided.

V.D. Unit

(*a*) The main requirement is for the avoidance of congestion in handling a large number of ambulant patients. Generally speaking, the number of bed patients in a V.D. department is small. A high proportion of its patients are only detained for in-patient treatment for a matter of twenty-four hours or so. It is

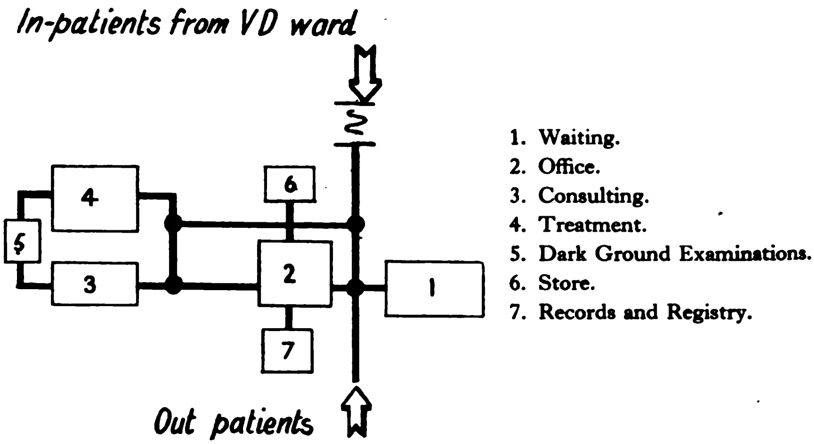

FIG. 7.—V.D. DEPARTMENT, TO BE CONTIGUOUS TO V.D. IN-PATIENT DEPARTMENT.

convenient to deal with out-patients in the same unit to save staff, time, equipment and accommodation. This ward therefore should always be planned to be near to the general O.P. entrance so that V.D. out-patients may not only be dealt with in the V.D. unit and not in the general out-patients at all, but also would not need to go all through the hospital to get there.

(*b*) Accommodation required in addition to that provided in the standard ward ancillaries is therefore—

Waiting room.
Office.
Treatment room.
Departmental office for the Specialist in Venereology, to serve also as a private consulting room for special cases.
Dark ground room.

There is rarely any requirement for an irrigation room.

In addition to the normal ward accommodation there should be provided a small number of single rooms for officer patients or other-rank patients whose condition is serious or who for some other reason require separation.

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Two separate W.Cs. and two separate baths should also be provided as part of the usual ancillaries.

A circulation diagram is at Fig. 7.

Psychiatric Unit

(*a*) It is desirable that the pavilion type of ward be adopted for reasons of ease of supervision. The special accommodation required different from or in addition to that normally provided consists of—

One or two silent rooms (can be ordinary single rooms).

One or two special protected rooms with, if possible, lavatory accommodation separate from the rest of the ward.

The remainder of the beds can be accommodated in a single open ward with the normal standard ward ancillaries.

In addition to the doors, lights, windows, etc., all baths, lavatories and wash-basins must be provided with special fittings, suitable for the protection of mental patients.

(*b*) It is essential that particular attention is paid to ventilation of the protected rooms. The protected rooms must have no projections ; fixed windows must be provided, out of reach of the patient. An observation window must be fitted to the wall or door, and must render *all* parts of the room visible.

(*c*) There is no need for a psychiatric testing room or any other special accommodation for the unit. Out-patients can easily be dealt with in the ordinary out-patients' department, and here again no special requirement has to be met.

Therapeutic and Diagnostic Departments

Physiotherapy Department

(*a*) The physiotherapy department provides two forms of treatment :

(i) Rehabilitation exercises.
(ii) Electro-therapy and massage.

(*b*) For the first requirement there is needed a small "gymnasium" where such articles as wall bars, static bicycles, ropes, pulleys and sandbags, etc., can be used by the patients under the supervision of the physiotherapist.

(*c*) An electro-therapy and massage section requires cubicles where patients can undergo treatment by short wave diathermy, Faradism, U.V.L., infra-red rays, etc., and have massage and manipulative exercises. A Faraday cage will have to be provided for the cubicles used for short wave diathermy, although this can be avoided by using wave lengths of 6 m. or less (as is now done in the standard Army set), except where interference with radar may be caused.

(*d*) It is desirable to have dressing cubicles in the gymnasium. Toilets for staff and patients are necessary and the physiotherapists require a staff room and store. There should be no need for a consulting room within the department for

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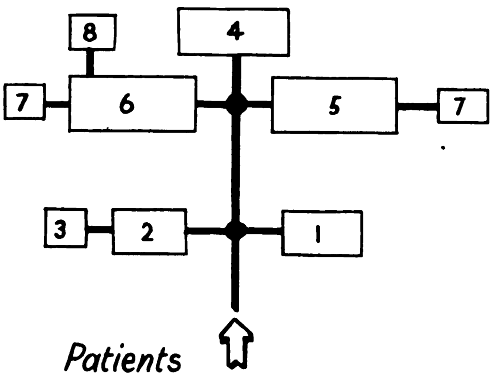
the specialist in physical medicine in addition to the usual M.O.'s room, except with the major hospitals of a Command where such a Command Specialist is borne on the establishment.

(*e*) The whole department may require to be air-conditioned in tropical climates.

(*f*) A circulation diagram is at Fig. 8.

X-Ray Department

(*a*) Requirements for the X-ray department are that it should be so situated as to be readily accessible both to out-patients and in-patients and to the operating theatres. The Recommendations of the British X-ray and Radium Protection



1. Waiting.
2. Office.
3. Store.
4. Physiotherapists.
5. Exercise Room.
6. Electrotherapy and Massage.
7. Changing Cubicles.
8. U.V.L. Room (if separately provided).

FIG. 8.—PHYSIOTHERAPY DEPARTMENT.

Committee—Second Revised Report (1948)—should be closely studied. The following room sizes of the accommodation required for a major hospital would meet their requirements :

(i) X-ray screening room—floor area of 25×18 ft. (=450 f.s.) and with a W.C. adjoining.

(ii) General radiography rooms—
one for chests, sinus and trunk work ;
one for extremities.
(Dimensions for chest, etc., room should not be less than 17×15 ft. (=255 f.s.) and the extremities room can be somewhat smaller.)

(iii) Dark room, about 100 f.s. in area and having access, if possible, to both the screening and the radiography rooms ; if not, to the radiography room.

(iv) Radiologist's office.

(v) Clerk and record office.

(vi) Radiographer's room and radiography materials store.

(vii) Waiting rooms—preferably divisible for O.Rs. and officers. (These rooms are essential since out-patients as well as in-patients are dealt with.)

(viii) Dressing cubicles : Four cubicles each 6×4 ft. are necessary where male and female patients are to be dealt with in the one department, and should be provided both for the screening and radiography rooms.

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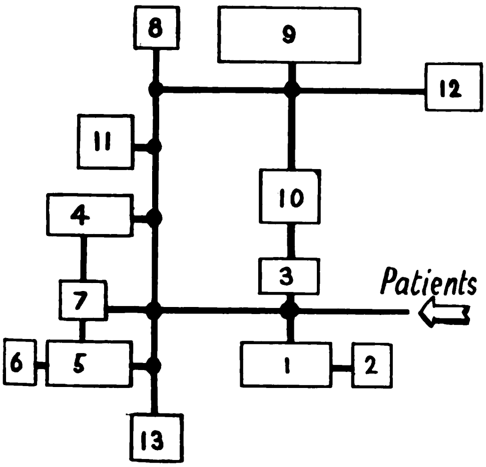
(*b*) Layout of the department, the provision of means of protection from radiation, the location of wiring and power points and provision of supports of adequate strength for the weight of certain equipment all require considerable detailed planning, and these requirements must be given to the architect before he attempts to begin planning the location and layout of the department.

(*c*) The department requires air conditioning in tropical climates.

(*d*) A circulation diagram is at Fig. 9.

Operating Theatre Suite

(*a*) Requirement generally is for one or more clean operating theatres, one "septic" theatre and one plaster room (plaster room can be combined with "septic" theatre in a small hospital). Separate changing rooms and sanitary



1. Waiting.
2. Toilet.
3. Office.
4. Radiography.
5. Screening.
6. W.C.
7. Dark Room.
8. Film Drying.
9. Radiographers.
10. Radiologist.
11. Film Store.
12. General Eqt. Store.
13. Records and Exposed Film Store.

FIG. 9.—X-RAY DEPARTMENT.

accommodation must be provided for surgeons, sisters and orderlies. A north or east aspect is most desirable for the operating and anæsthetizing rooms. 400 f.s. is the minimum size acceptable for a main theatre.

(*b*) The following will also be required :

Instrument sterilizing room(s)	Stock room, linen workroom and instrument room
Instrument wash-up and sluice(s)	Duty room
Surgeon's scrub-up(s)	Trolley bay
Anæsthetic room(s)	
Dirty linen bay	

Instrument sterilizing and surgeon's wash-up can be centralized or divided into two set-ups, one to serve the clean theatres and one to serve the septic theatre and plaster room. An anæsthetizing room should be provided for each of the clean theatres (or one anæsthetic room should be accessible to either), and an anæsthetic room should be also provided accessible to both the septic theatre and the plaster room.

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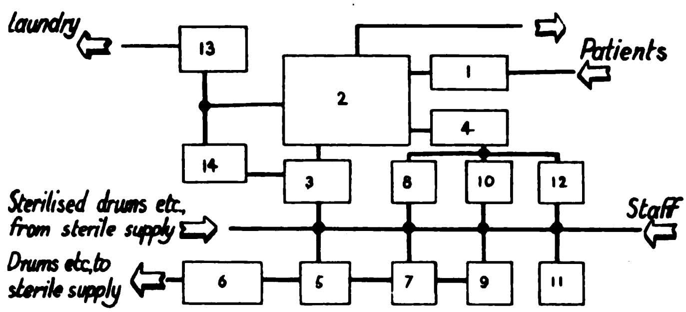
(*c*) The operating theatres should be provided with air conditioning in sub-tropical and tropical climates.

(*d*) A circulation diagram is at Fig. 10.

Central Sterile Supply Department

This department maintains the supply of sterile sets for the performance of minor surgical and medical procedures in the wards and departments. It has to be run usually by the operating theatre staff and therefore it is desirable that it be included as part of, or adjacent to, the operating theatre suite. The accommodation has to provide for the reception of used apparatus from the wards and



1. Anæsthetic Room.
2. Operating Room.
3. Sterilizing.
4. Surgeon's and Staff Scrub-up.
5. Instrument Room.
6. Linen and Stock Room.
7. Sister's Duty Room.
8. Sister's Changing, W.C. and Shower.
9. Orderlies Room.
10. Orderlies' Changing, W.C. and Showers.
11. Surgeon's Office.
12. Surgeon's Changing, W.C. and Showers.
13. Dirty Linen.
14. Instrument and Macintosh Sluice.

FIG. 10.—OPERATING THEATRE SUITE.

departments, its cleaning, packing and sterilization, and its issue on demand to wards and departments. It can also contain the theatre autoclaves. It can function adequately in one room of good size, or can be split up into four separate rooms—receiving, packing, sterilizing and issue rooms.

Pathological Department

(*a*) *The Laboratory.*—In cases where no provision has to be made for a central command pathological laboratory and the accommodation is to be confined to that necessary for the hospital itself, this consists of—

Main laboratory } both with north aspect.
Pathologist's laboratory }
Wash-up.
Autoclave room.
Media preparation room.

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The wash-up should be adjacent to the laboratories, the autoclave room opening off it. The media room should not open directly off either of these, or off any *main* corridor.

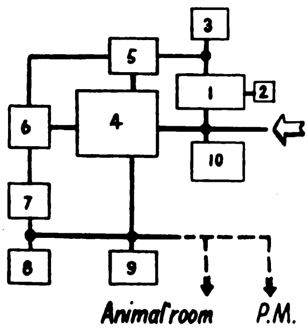
Office and store.

Laboratory staff room and cloakroom (only in large hospitals).

Animal room and fodder store (which may often be provided in a separate building outside).

Waiting room, with patients' lavatory comprising—
one urinal, one W.C., one commode (specimen commode).

(*b*) *Clinical Side Rooms.*—In addition to the laboratory there should be provided some clinical side rooms for medical officers and nursing officers to carry



1. Waiting.
2. W.C. (including Specimen Commode).
3. Office.
4. Main Laboratory.
5. Pathologist's Main Laboratory.
6. Wash-up.
7. Autoclave Room.
8. Media Room.
9. Store.
10. Staff Room.

FIG. 11.—PATHOLOGICAL LABORATORIES.

out investigations such as blood counts, blood films, erythrocyte sedimentation rates, etc. One per floor is a sound basis.

(*c*) *The Mortuary.*—Outside the hospital itself, but adjacent to it, provision has to be made for a post-mortem department, comprising—

Mortuary and post-mortem room.

Viewing room (which can be used as a chapel if required).

Changing room.

Coffin store.

A refrigerated body store should be provided in the mortuary.

(*d*) *The Blood Bank.*—This would normally only comprise one or more refrigerators in the main laboratory.

(*e*) A circulation diagram of the laboratories is at Fig. 11.

DENTAL DEPARTMENT

This department is dealt with in the section devoted to out-patients.

[*To be continued*]

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MEDICAL COVER

BY

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[*Continued from page* 39, *January issue*]

Hospital Services

Sick persons can be divided broadly into three groups—

(1) Those suffering from minor ailments who do not require treatment in bed.
(2) Those requiring simple treatment in bed.
(3) Those requiring special treatment in bed or in special clinics.

In the civilian community of Great Britain, groups 1 and 2 are normally treated by the family doctor, and remain in bed at home. Hospital services are only designed to cover group 3.

In the Army, whereas the majority of group 1 cases can be treated in their unit, hospital accommodation has to be provided to cover groups 2 and 3. The institutional care of patients in the Army in peace time is covered by three types of unit, the Reception Station, the General Hospital, and the Convalescent Depot.

A military hospital is designed to cope with a larger proportion of sick than would be expected in a civilian hospital from a population of the same size. In addition, there are Reception Stations, which are small hospitals equipped to deal with minor cases, having no true civilian counterparts. Perhaps the sanatorium of a boarding school is the nearest comparison that can be made. These arrangements are necessary owing to the complete absence of domiciliary treatment in the Army. On the Medical Officer's orders a man may remain sick in the unit lines for a short period, usually limited to forty-eight hours, but only when the condition is purely temporary and not likely to last beyond the prescribed period, such as the reaction after an inoculation. Any other type of case that in civilian life would remain in bed and be looked after at home must, under ordinary circumstances, be admitted either to hospital or reception station. Exception to this rule, of course, can be made in the case of a married man living in quarters, where his wife is able to look after him, but here again this only applies to a small proportion of the whole.

The reasons for this are obvious. First, a sick man in a barrack room with a lot of normal healthy men is out of place. He is unable to get proper rest, nursing, or suitable food. Also, it is not good for troops' morale to have a sick man in their

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midst. Secondly, efficient hospital treatment is the best way to ensure that the man is restored to fitness in the shortest possible time, and unnecessary man-power wastage is avoided. Prolonged absence from work, on account of a comparatively minor ailment, tends to produce boredom and neurosis in a young man, and the sooner he is restored to his normal life the better it is for everyone.

A similar policy lies behind the provision of Convalescent Depots. Prolonged convalescence, especially if accompanied by an overdose of pity and undue sympathy, can often undo all the benefits gained by previous military training. The aim of convalescence, in the Army's view, is to restore the patient as rapidly as possible to the same state of health that he enjoyed before he received his injury or fell ill, and to implant in his mind the feeling that he has been completely and satisfactorily cured.

The military hospital system therefore provides for a much longer period of supervision of its cases, as well as for a greater number of patients, than does its civilian counterpart, with the object of admitting men in the early stages of their illness and making certain they are fully restored to health before sending them back to normal life again.

Military hospitals are, as far as possible, housed in permanent buildings. In Great Britain there are several old-established military hospitals in existence, and in occupied territory existing hospital buildings, civil or military, can be taken over and used as such by the Army. In some stations, temporary buildings such as huts or even tents can be used, to enable hospital facilities to be provided while permanent buildings are being planned or constructed, or to cover the period of stay of a force whose occupation of that particular place is only for a limited time.

In war time, establishments are laid down to enable staffs, stores, and equipment to a set scale to be collected together and transported to the required site in the shortest possible time, so that a hospital can open for the admission of cases with the minimum delay.

Civilian hospital beds are not so readily available to the general public on the whole, nor are they needed in quite the same way as those for Army personnel. For a much larger population, covering all ages and an approximately equal proportion of both sexes, with a relatively much higher incidence of serious illness, more provision must be made for the seriously ill, and less for those who can perfectly well be treated in their homes. Special hospitals need to be provided in addition to the general hospitals to deal with special types of cases—e.g. infectious fevers, tuberculosis and mental diseases, which do not occur to the same extent in the Army.

The provision of hospital beds under the National Health Service Act is made on a regional basis, to cover a large area of fairly dense population, and the aim is to provide as far as possible what is required of each particular type.

The provision of civilian hospital beds at present depends to a very large extent upon what is already in existence. The building and equipping of new hospitals or the enlargement of existing ones is an expensive task, and the real need for such an undertaking has to be carefully considered before any such

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project is launched. Civilian hospitals in England having arisen in a purely haphazard fashion in the past, depending upon either the generosity of some local benefactor or the wealth of a Local Authority, any attempt to distribute beds evenly to meet the needs of the present-day population presents different problems in every region.

It is not possible to meet the community's needs simply by consulting an official book and producing a suitable establishment of staff and equipment, medical and otherwise, to satisfy these needs. Nor is it possible to put such a hospital into operation by requisition of premises, drawing from store the equipment required, and posting in from elsewhere the staff to run it.

Money must be raised, plans drawn up, equipment bought and the building established before the appointment of the staff can finally be considered.

The Regional Hospital Boards therefore are faced with the problem of first making the best of what is already in existence, and then that of careful planning to meet further needs.

The formation of Hospital Regions has given a great opportunity for the scope of the existing hospital services to be extended for the benefit of the community.

The Regional Hospital Board, taking over a motley collection of hospitals of all types, sizes, and degrees of efficiency, is faced first of all with the function of planning the regional services generally, and then fitting each hospital into that plan in the most suitable way. It also has the power to appoint directly all the senior administrative and professional staff. Thus, it is in a position to co-ordinate all types of hospital within its region, to sort out any previous difficulties, and modify anything considered unsuitable. Specialist facilities and nursing staffs previously confined to a limited area can now be more widely distributed to greater advantage.

By remaining a regional and not a central organization, there is not the same degree of rigid standardization that a central body generally demands. Special plans to suit local needs can be made without the sanction of higher authority being needed.

Local day-to-day administration of a civilian hospital is carried on by the Hospital Management Committee. This carries a small financial responsibility which enables further decentralization to take place.

When hospitals are grouped under one Hospital Management Committee, each hospital has a house committee, which forms yet another "administrative layer."

Thus, the civilian hospital service of a region is comparable to the military hospital service of a Command. Specialists are appointed to Commands rather than to individual hospitals, and their services are available to the personnel of the whole Command. Similarly, the general medical and dental services are planned on a Command basis, the distribution of such services being determined by the Senior Administrative Medical Officer in such a manner as to meet all needs.

Military hospitals are provided in accordance with the estimated number of sick and wounded. The number of hospital beds required by an operational force

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is generally estimated at 5 per cent. of the total strength of the force. This figure varies slightly according to local conditions, such as the climate and prevalence of disease, and the length of time patients are being held in the theatre of operations before being sent further back. This may be limited to 60 or 90 days, according to the nature of the campaign.

Under conditions of peace, as in the United Kingdom or B.A.O.R. at the present time, the number of hospital beds is approximately 2 per cent. of the total force. In U.K., for example, beds for 1.75 per cent. of troops stationed at home are provided, with beds for an additional 0.2 per cent. of the total overseas strength of the British Army, to accommodate cases evacuated home from overseas.

The total number of military hospitals that can be provided is not limited. Their distribution is determined according to the number of troops to be served rather than by geographical factors.

In war time the establishments of hospitals are standardized, and hospitals consisting of 200, 600 or 1,200 beds are provided in accordance with the strength of the fighting force.

In peace time each hospital has its own establishment, made to suit the needs of the particular garrison it serves. Special departments to cover the whole force may be localized in certain hospitals only, or, if the garrisons are separated from each other by many miles, a hospital giving as general a range of services as possible is provided for each.

For families, additional beds for 1 per cent. of total families' strength are provided in overseas stations, there being no fixed home service scale.

In civilian hospitals in England and Wales at present the total number of beds available, including all types, amounts to approximately 1 per cent. of the total population.

The officer in charge of a military hospital is invariably medically qualified. Although his duties are practically entirely administrative, his outlook is influenced to a considerable degree by his medical knowledge, and clashes between the opinion of the professional man and that of the lay administrator do not occur.

Like civilian hospitals, military hospitals are generally situated within or in the vicinity of a large town. This has the advantages of public services being available, of being well placed for communication purposes, and easily found by those who are strange to the country. During war time sites within a town should be avoided on account of the risk of bombing, and under such circumstances a rural site, well marked with the Red Cross, is preferable.

Isolated groups of troops, living out in the country either for strategic reasons or for training purposes, generally have a reception station near by, to cope with their sick. Local arrangements are made for dealing with acute surgical cases brought into them, which cannot be evacuated to hospital, either by mobile surgical teams being available, who can be brought rapidly to the required place, or, in a civilized country, by making arrangements for a local civilian hospital to take over such cases. Reception stations act both as treatment centres for minor sick and evacuation centres for those cases requiring hospital treatment.

Army hospital beds are therefore not entirely concentrated in one central

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place, but are in effect spread over the entire territory to meet the needs of the military population, making hospital facilities easily accessible to all.

To meet war-time needs, the Medical Services can be expanded so as to provide a mobile hospital service for the fighting forces. Mobile units are formed, together with mobile teams of specialists, to enable the medical services to extend as far forward as possible, bringing as it were the hospital up to the wounded rather than the wounded having to be brought back many miles before they can get any treatment.

Under present-day conditions of warfare, however, it is not only the fighting services for whom special expansion of medical services has to be made. The civilian population nowadays becomes exposed to a practically equal risk, and therefore analogous war-time arrangements need to be made. Undoubtedly these follow army lines in general, and involve evacuation of hospitals from the danger zone to a safe area, rapid evacuation of casualties, the sorting out of casualties according to the nature and severity of their wounds, mobility of specialist teams, and reliance on the Red Cross as a protection against enemy attack. In the United Kingdom the two services, Military and Civil, work together, each one dealing with the casualties of either, wherever they may occur.

[*To be continued*]

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

BY

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and

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[*Continued from page* 47, *January issue*]

Chronic Intermittent Carriers

As indicated above, two excretors are classified as chronic intermittent carriers (*S. paratyphi A* excretor No. 12 and the double excretor of *S. typhi* and *S. paratyphi A* No. 3); and a third (*S. paratyphi A* excretor No. 11) may be such and has been so assessed in considering schistosomiasis and urinary antibody rates. *S. paratyphi C* excretor No. 8 and double excretor No. 14 are also intermittent carriers. The results of culture and of urinary antibody determinations on the first four are recorded diagrammatically in Fig. 1. Similar representation of chronic persistent carriers No. 9 and No. 20 is included in the figure for purposes of comparison.

Culture

Carrier No. 12.—Early observations on this case suggested that apparent intermissions in urinary excretion might in fact be due to technical inadequacy as suggested for apparent intermission of fæcal excretion by Holt and Wright (1942), since partial culture failures and a viable count indicate wide variation in the numbers passed at different times. These findings are presented in Table VI. Regular success of daily cultures in four groups of six (see Fig. 1) 9 months after the first isolation, however, was followed after 6 weeks by twelve consecutive negative examinations within a month. For these last twelve examinations both selenite and McConkey mannite were used on each occasion and direct plating on eight occasions. There is thus little room for doubt that true intermission of excretion was occurring in this case.

Carrier No. 3.—The results illustrated in Fig. 1 might equally represent reinfection. Examinations were, however, continued. Detailed results were as follows: *S. paratyphi A* was isolated on primary examination, from the first positive culture 17 months later and again after 23 days. As recorded under "Double Carriers," carriage of *S. typhi* synchronized with that of *S. paratyphi A* at least during the last month of observation.

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Carrier No. 14.—The findings in this case are not illustrated in Fig. 1. They were as follows: *S. paratyphi A* was isolated on first examination. Four months later when examinations were resumed four specimens within 8 days were positive (one yielded *S. typhi* as well as *S. paratyphi A*). Six weeks later *S. paratyphi A* was still present in the urine. Fifty-nine cultures were then negative, after which *S. paratyphi A* reappeared once. Four more negative daily cultures followed. Then 6 days after the culture of *S. paratyphi A*, *S. typhi* was again isolated.

Intermission seems a more probable explanation than repeated reinfection of the results of examination on No. 3 and No. 14.

TABLE VI.—DETAILS OF EARLY CULTURE RESULTS FOR CARRIER 12

No.	Interval	Direct Plate	Selenite	Tetra-thionate	Viable Count per ml.
1	—	+	−		
2	1 day	−	+		
3	1 day	+	+		
4	11 days	−	+		
5	1 day	+	+		
6	1 day	+	+		500,000
7	12 days	−	−		
8	1 day	−	−		
9	1 day	−	−		
Pool of	7, 8 and 9	−	+		
10	33 days	−	−		
11	1 day	−	−		
12	20 days	+	−		
13	1 day	+	+		
14	1 day	−	+		
15	12 days	−		+	
16	1 day	−		+	
17	1 day	−		+	
18	12 days	−		−	
19	1 day	−		−	
20	1 day	−		−	
21	12 days	−		−	
22	1 day	+		+	
23	1 day	+		+	

Isolation of *S. paratyphi A* shown as +, failure of isolation as −.
No entry under a heading indicates that the method was not used.

Urinary Antibodies

It should be recorded that the antibodies detected in the urine of carrier 11 were predominantly heterologous (see also note (*a*) to Table II). The incidence was as follows:

ANTIBODIES/EXAMINATIONS

		Homologous	Heterologous (antigens)		
Titre	1/4 or over	0/22	2/22 (*b*)		2/22 (*d*)
Titre	1/2 or over	2/13 (with 2 more at 1/2 tr)	6/13 (*b*)	1/13 (*c*)	6/13 (*d*)

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Schistosomiasis

Schistosome ova were present in the urine of each of these carriers. The total incidence of positive examinations was 28/103 (27 per cent.), while of the 82 examinations on specimens from the three regarded as chronic, 24 (29 per cent.) were positive.

Though antibodies were not detected in the urine of carrier No. 8, R.B.Cs. and W.B.Cs. were seen four times, R.B.Cs. alone once and W.B.Cs. alone twice in the 14/17 specimens which were negative for ova. A plasma leak was thus indicated not less than 8/17 times.

Transient Carriers

Transient carriage commonly ceases within 4 weeks of defervescence. Prolongation beyond 3 months is rare (Vogelsang and Bøe).

It is, however, necessary to establish that excretion has in fact permanently ceased and this requires continued observation in view of the long periods of freedom from excretion which may occur in cases of intermittent carriage (*vide* Fig. 1). On the other hand, as stated above, the reappearance of organisms in culture after such "intermissions" may really represent fresh transient excretion following reinfection.

In view of the foregoing *S. paratyphi C* excretor No. 23 has been classified after 10 months' apparent freedom from excretion as a *transient carrier*. As already suggested, *S. paratyphi C* excretor No. 24 and *S. paratyphi A* excretor No. 25, culture-negative for 2 and 3½ months respectively, are probably also transient carriers.

Schistosomiasis

No schistosoma ova were observed on seventeen examinations of specimens from execretor No. 23 and on five examinations and seven examinations respectively on the urine of excretors No. 24 and No. 25. This may be a significant indication of transient bacilluria rather than chronic carriage.

Type Incidence

Our material has thus yielded ten chronic persistent carriers, three most probably (and two possibly) chronic intermittent carriers and three probably transient carriers. These numbers, however, cannot be considered to afford a true index of actual or relative frequency of occurrence. A pool of three specimens provided the standard inoculum in the routine investigation of each food-handler. The nature of transient and intermittent carriage greatly reduces the chances of detecting either by the culture of a few samples only.

It is nevertheless possible to suggest limits between which the incidence of chronic carriers in the population under investigation, which consisted of adult male food-handlers almost exclusively Egyptian and Sudanese, may lie, and certain data bearing upon the total carrier incidence among them will also be considered.

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Chronic Persistent Carrier Rate

Six established chronic persistent carriers were all found in the space of 3½ months. The average number of individuals examined per month over 12 months in which this period is included was slightly under 500. This suggests an incidence of 0.35 per cent. If the ten proven and presumed chronic carriers listed in Table V are considered, however, incidence was spread over 13 months and falls to 0.16 per cent.

In both cases sources of error lie in the impossibility of arranging follow-up examinations on all excretors detected, so that some chronic carriers may have escaped classification, and in the number of re-examinations among the routine tests carried out. Probably only about one in three of the tests were first examinations. The rest were for annual re-examination. Chronic persistent carriers should thus have been already excluded from those producing about two-thirds of the samples.

A consideration of the carrier rates found in the primary test and retest sub-groups affords a further indirect method of assessing the chronic carrier rate. The incidence of carriers in the former was 1.12 per cent., while the latter yielded 0.63 per cent. If it be assumed that primary screening for chronic persistent carriers had been completely effective, the second figure represents later infections and intermittent cases. If this recent infection and intermittent rate be considered generally applicable the difference between these rates (i.e. approximately 0.5 per cent.) would represent the chronic persistent carrier rate. We may thus infer a chronic persistent carrier rate between 0.16 and 0.5 per cent.

Miller (1949) found a carrier rate of 3 per cent. in a Nile Delta village. He deduced from the age incidence that the majority were not chronic carriers, but considered that about one-quarter (i.e. 0.75 per cent.) were such.

Chronic Intermittent Carrier Rate

It is doubtful if any estimate of value can be given for the incidence of chronic intermittent carriage on the scanty material available, and in view of the uncertainty of their detection. An attempt to do so, however, based on the average number of individuals examined, the number of probably or possibly chronic intermittent carriers observed and the chances of their detection, suggested an incidence between 0.13 and 0.65 per cent. Chances of detection were calculated from the probability of one or more of three examinations being positive if the frequency of isolation observed in different cases were taken as representative.

Total Carrier Rate

Owing to difficulties of detection any observed rate is likely to be below the true incidence even over a short time range, and well below the annual incidence which will depend on the attack rate and the proportion of convalescent excretors among those who have been infected. Recent observed rates in the population studied by us have varied from 1.96 over 4 months to 0.68 over the following 7 months; the rate over the whole period being 1 per cent. As already stated,

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however, the majority of those tested had been previously examined and were thus a selected group in whom the incidence should be below average. Earlier observations in our laboratory showed a rate of 1.46 per cent. over 7 weeks (Ashton). The urinary carrier rate observed on first examination of a comparable group of food-handlers in the Canal Zone in 1950 was 1.37. Miller, as quoted above, found an all-over carrier incidence of 3 per cent. in a village. The population studied by him was of all ages and both sexes, but the incidence detected was five times as great in males as in females and among the former most carriers were adolescents and young men. He also produced evidence for an enteric rate of 1.4 per cent. per annum with a 16 per cent. carrier rate among those infected within the previous two years. No direct evidence of the enteric rate among the food-handlers we studied was available, but the detection of three double carriers suggests that exposure to infection is frequent.

Numbers of Organisms Passed

The numbers of viable organisms passed by chronic persistent carriers with the highest and the lowest counts when more than one examination was carried out is shown in Table V. The result of a similar test on chronic intermittent carrier No. 12 is given in Table VI. Counts were also made on the unclassified carriers No. 18, No. 27 and No. 28. No. 18 passed 400,000 and 200,000 organisms per ml. respectively in two tests. No. 27 passed 2,000,000 organisms per ml. No. 28 passed 3,000 per ml. *S. paratyphi A* and 30,000 per ml. presumptive *S. typhi* on separate occasions.

The very large numbers so frequently passed indicated the infectivity of the urine and the possible danger of hand contamination. This has been studied by Chadwick (1951), who found that such carriers were capable of infecting milk and contaminating cloth immediately after micturition once in every five tests. The ease with which isolation by simple methods from such heavy excretors should be accomplished is obvious.

Four of the nine chronic persistent carriers on whom more than one viable count was performed, however, show a wide range in the numbers passed on different occasions. An even greater degree of variation than that demonstrated by the viable counts made was sometimes apparent from observation of direct plate cultures of a loopful of urine.

Thus: Carrier No. 1 passed 20,000 and 23,000 organisms per ml. on two occasions, but showed only eight colonies on a direct plate on a third.

Carrier No. 2 passed over a million organisms per ml. on three occasions, but only one colony developed on a direct plate on another. Reference to the failure of two further viable counts and to frequent failures of viability in fluid cultures of this strain has already been made. While carrier No. 4 showed wide variation in viable counts, the occurrence of only four organisms on a direct plate indicated the presence on that occasion of far fewer organisms than the 50,000 per ml. found in the lowest viable count.

The results of culture tabulated in Table VI suggest that very small numbers were frequently passed by chronic intermittent carrier No. 12.

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When rough organisms are passed viable counts may be invalidated by failure of division and a preponderance of abnormally long forms, and by the aggregation of the organisms into clumps. Each of these occurrences will lead to colony counts which are too low.

Schistosomiasis in Carriers and Others

The incidence of schistosomiasis among twenty-three urinary excretors of enteric group organisms and the frequency with which the ova could be detected in positive cases by the simple method used is shown in Tables I–IV.

The results of single and multiple examinations for schistosomiasis on the different types of carrier and on control groups are summarized in Table VII. Assessment of the significance of the differences shown in the table presents certain problems.

Thus our samples of the better defined carrier groups are too small for valid comparison of the schistosomiasis rates in them with that in control group (*h*). The latter is itself a small group, but no direct comparison of schistosomiasis rate can be made with the larger control group (*e*) as members of that group were only examined once. Further, the comparison of group (*h*) is not strictly comparable with that of the carrier groups.

If, to make use of the largest possible number of observations, *all* excretors are considered—group (*d*)—there is no significant difference in the infestation rate in them and in control group (*h*). The difference between the schistosomiasis rate for all chronic carriers—group (*a* and *b*)—and the control group is, however, probably significant though both groups are undesirably small.

The number of positive examinations for ova when members of representative samples from groups are submitted to frequent examination is a further possible basis for comparison. Here two factors are involved—infestation rate, and excretion rate in the infested (the latter presumably varying according to the severity of the infestation).

If it is assumed that the samples are representative, the difference between this positive examination rate for all excretors of enteric organisms —group (*d*)— and for control group (*h*) is significant.

With regard to the question of representative samples, consideration was given to the possible validity of a comparison between the examination rate in groups (*a*), (*b*) and (*a* and *b*) (few persons, many examinations), and group (*e*) (many persons, single examinations), on the grounds that, if samples were large enough to be truly representative, the proportion of positive findings on a given number of examinations will be the same in both cases. It was considered that with regard to the actual groups under observation such a comparison could not be made. It is, however, of interest in assessing the quality of our samples, and the validity of the correction factor used in calculating a schistosomiasis rate for groups (*e*) and (*f*), to note that—

(1) The average chance of detecting the positive cases of schistosomiasis in group (*h*) was 1/2.13 (compared with 1/2.19 for fifteen carriers with schistosomiasis—the correction factor used).

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(2) The actual detection by one examination in group (*h*) was *nil.*

(3) The positive examination rates in group (*e*) (single examination of many) and group (*h*) (many examinations of few) are not significantly different.

It thus appears that the sample in group (*h*) is too small to be of value in respect of single examinations for ova, but is adequately representative when a number of examinations is carried out.

TABLE VII.—SCHISTOSOMIASIS IN CARRIERS AND CONTROLS

Group	Composition of Group		Schistosomiasis Rate		Schistosoma Ova seen			
					On First Examination		On Complete Investigation	
	Classification	No. in Sample	Observed %	Calculated % (i)	No.	= % +	(+/No. exams.)	= % +
(*a*)	Chronic persistent carriers	10	80		7		82/181 (ii) (82/145)	45.3 (56.5)
(*b*)	Chronic intermittent carriers	3	100		0		24/82	29.3
(*a*) and (*b*)	All chronic carriers	13	84.6		7		106/263 (ii) (106/227)	40.3 (46.7)
(*c*)	Transient carriers	3	0		0		0/29	
(*d*)	All urinary excretors of enteric group organisms (iii)	26	61.5		10	38.5	120/351	34.2
(*e*)	Control group : Food-handlers	676		29	89	13.2		
(*f*)	Control food-handlers passing urinary antibodies	38		75	13	34.2		
(*g*)	Control food-handlers followed up on account of Schistosomasis detected at first test	7			7		28/49	57
(*h*)	Control group (Sanitary labourers and cleaners)	15	40 (iv)		0		39/218 (v)	17.9

Notes (i) This figure was calculated as follows :
Ova were found in 118 of 258 examinations made on fifteen carriers in whose urine they were eventually found. The chance of finding ova by one examination as here carried out on persons showing the average degree of infestation is thus 1 in 2.19. Where only one examination had been carried out, therefore, the number of positives found was multiplied by 2.19, the figure obtained divided by the number of persons in the group and the result multiplied by 100.

(ii) 181 and 263 examinations for groups (*a*) and (*a* and *b*) respectively include 36 on carriers No. 4 and No. 22 in whose urine ova were never detected. The figures in brackets are those for ***proved*** schistosomiasis cases, these two being excluded.

(iii) Includes three extra to those listed on Tables I–IV which were detected on follow-up of antibody excretors, and excludes No. 28 (who was not examined for ova).

(iv) All except one, however, passed urine containing R.B.Cs. on from one to nine occasions. The exception passed leucocytes once.

(v) Individual frequency ranged from 3/15 to 13/15, with a total of 47 per cent. positive examinations on the six proven cases (39/83).

[*To be continued*]

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HEALTH IN THE ARMY

BY

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Royal Army Medical Corps

[*Continued from page* 59, *January issue*]

Personal Hygiene

Under this heading will be discussed Health Education and all those factors which together form the soldier's environment. Lastly, but by no means least in importance, may be mentioned Dental Care, an essential contributor to good health of the individual.

Health Education

During the period between the First and Second World Wars the Regular Army was a comparatively small force, stationed for the most part in well-ordered garrisons at home and abroad. Prospective recruits were required to have attained certain educational standards before enlistment, regimental *esprit de corps* was strong, and discipline, based on man management, was generally of a high order. Under these circumstances Health Education presented no great difficulty ; the whole atmosphere of Service life—the ordered routine and the example of seniors—soon engendered in the recruit a wholesome, if often subconscious, realization of the benefits of a healthy life. Some formal instruction was also given : Regulations for the Medical Services of the Army prescribed that officers in medical charge of troops would deliver lectures to officers and men on hygiene and sanitation and on venereal disease [14].

The introduction of National Service in 1939 revealed amongst the conscripts a high proportion of illiterates, of whom the Army's share was greater than that of the Royal Navy and Royal Air Force which had prior choice on account of their more technical duties [15]. The vast expansion of the Army during the war, with its dispersal in small detachments throughout the country and overseas, and its dilution with men of all types suddenly removed from their native environment, necessitated a new approach to Health Education. Gradually an effective organization and system were developed. Early in the war all units were ordered to devote a minimum number of instructional periods to subjects of a general educational nature ; talks were given and discussions conducted, sometimes by visiting lecturers, sometimes by regimental officers using Army Bureau of Current Affairs publications for their guidance. Subjects were of general interest and included such themes as "The Health of the Citizen," "Social Insurance," and kindred topics. Short films and cartoons were featured in ENSA programmes

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and articles on general health topics appeared in Forces newspapers and magazines.

More specialized Health Education was given by the Medical Service on such subjects as personal hygiene, prevention of scabies, care of the feet, venereal disease, malaria and tropical hygiene. Many methods were used to spread knowledge ; amongst them may be mentioned lectures by medical officers, often accompanied by short films or cartoons, pamphlets in unit Information Rooms, posters in prominent places, appropriate films shown in troopships to all drafts proceeding overseas, and local education campaigns, especially in theatres abroad, organized by Field Hygiene Sections and Anti-malaria Units. In some areas inter-unit competitions were successfully used to stimulate interest in health matters [16]. The success which attended these efforts may be judged from the war-time health records of the Army ; one striking result of intensive education allied with strengthening of discipline may be quoted here—namely, the fall in malaria incidence in South-East Asia from 391 per 1,000 in 1944 to 60 per 1,000 in 1945 [17].

At the present time the importance of Health Education at all levels of the Army is widely realized, the objective, as in the case of the modern Public Health Service, being the attainment of positive health. The method aims at the continuous inculcation of good habits into every soldier, supplemented by formal training especially during his early service. At his Basic Training Unit he receives four lectures with films or film strips on personal hygiene—the daily routine : washing, eating, sleeping, use of leisure ; the structure and functions of the body ; an explanation of the causes of disease and methods of avoidance ; the value of immunization ; and the relation to himself of the work of sanitary inspectors and other health workers. Then follow six lectures on communal hygiene, dealing with the relation of the individual to the community ; Military Hygiene organization and its relation to the civilian Public Health Service ; the spread of disease : droplet, insect-borne, parasitic, excremental and venereal, and individual preventive measures ; individual methods for the protection of food and water ; correct communal habits ; elementary tropical hygiene, including malaria prevention ; and elementary nutrition. Finally, he is exhorted to make use of the knowledge he has gained. These lectures are given by non-commissioned officer instructors, who have been carefully selected and trained at the Army School of Health, from standard précis prepared by the Army Medical Department in conjunction with medical training establishments. Short courses at the Army School of Health are also held for Commanding Officers and Seconds-in-Command of Training Centres, in an endeavour to stimulate, where necessary, the interest of these officers in health matters.

Officer cadets have already received the recruits' health training during their service in the ranks and so are ready for more advanced instruction. The objects of this training are impressed upon them—namely, that the junior officer should have better knowledge of health matters than the men under his command, and to make them aware of the special responsibilities of commanders in regard to the promotion of health and the prevention of disease [18]. At the

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Royal Military Academy Sandhurst, where cadets are trained for Regular Commissions, twelve lectures and discussions are held, including the working of the hygiene services of the Army; officers' responsibility for their men; care of the soldier; mental health of the soldier; basic principles for the prevention of disease; more advanced instruction in nutrition and feeding of the soldier; and the importance of personnel selection and of wastage due to disease. At Officer Cadet Training Units, where cadets are trained for emergency commissions, six lectures are given, similar but with less detail on individual diseases, because the course is much shorter.

With regard to the enlightenment of more senior officers, Health Education is not neglected in the curriculum of the Army Staff College at Camberley. An indication of the importance attached to this subject is apparent in that the Director-General of Army Medical Services personally lectures on health discipline to each course of students.

Other specialized training is carried out at the Army School of Health and the Royal Army Medical College. Every medical officer attends a course in Army Health on first appointment, while more senior medical officers receive further instruction and must pass an examination before promotion to Lieutenant-Colonel. Every unit must have sanitary and water duty personnel, also one or more regimental officers trained in hygiene. This instruction is undertaken by the Army School of Health, as also is the training of Hygiene Assistants and the Tropical Hygiene training of sanitary personnel posted overseas, while courses for Army Health Specialists are held at both establishments.

The foregoing account deals with Health Education as affecting more particularly the life of the soldier during his service with the Colours. A further aspect now merits consideration. During and since the war a high proportion of the young—and not so young—men of this country have spent some period of their lives in the Armed Forces, the majority in the Army as being the largest Service. Undoubtedly there are many incorrigibles, but surely a great number must have derived some lasting benefits from their service and are continuing in civilian life to apply what they have learnt. If conscription has come to stay indefinitely, as at present seems likely, this process may well continue for many years: the majority of our men will spend a most impressionable period of their lives in one or other of the Forces, where they will be open to influences previously unencountered. It would seem, therefore, that the Army is now in a unique position, in a way hitherto unknown in this country, to make a major contribution to the health of the Nation. But the full exploitation in after-Service life of the advantages of this system is obviously outside the Army's province: here surely is the perfect opportunity for such bodies as the Central Council for Health Education to exert their influence, particularly on the type of man who would otherwise soon revert to his former squalor.

Environment

The environmental factors concerned in the health of the soldier are similar to those affecting all other people—namely, climate, accommodation, clothing,

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food, water, personal cleanliness, physical development, work and recreation. All of these factors, however, present additional aspects more or less peculiar to Service life. Some of these will now be considered.

Climate

The soldier may be called upon to serve in any kind of climate. The British Army has many years of experience of hot countries, and some, during the late war, of subarctic regions. Two basic factors contribute to the higher incidence of sickness in tropical than in temperate zones [19] :

A lower standard of general hygiene, due to physical difficulties of application, underdevelopment of the country and ignorance of the native inhabitants, leads to a greater incidence of communicable diseases such as enteric, dysentery, smallpox and specific tropical conditions ; and

The climate itself is more or less directly responsible for such ailments as prickly heat, loss of energy and neuroses.

Spectacular advances in the control of the former group have been made in recent years, and the day may be confidently expected when the risk of contracting these diseases will be as small as in the temperate zones. The second group presents more intangible problems ; undoubtedly the most realistic approach is the encouragement of a sound way of life, based on self-discipline acquired through enlightened Health Education.

Accommodation

Accommodation of the soldier differs radically from that of the average civilian in that provision must be made for the former to sleep, eat, work and play under one roof, as it were. In peace time he normally lives in barracks ; if married he may be allotted a married quarter, which range from tenement-like dwellings of older construction to pleasant modern houses for the more fortunate. Barracks are of comparatively recent origin—another product of the Industrial Revolution, with its need for troops to quell possible disturbances in the rapidly growing towns ; previously they had been quartered in civilian billets. The earlier barracks were drab, depressing, multiple-storeyed buildings, arranged usually in a hollow square. Improvements were gradually made until the "Sandhurst Block" was produced in 1933. This is a two-storeyed H-shaped building with barrack rooms, dining-hall, sanitary accommodation and drying rooms all under one roof. Later, numbers of single storey pavilion type barracks were built to house the intake of Militia in 1939. The present conception of a military camp is on the lines of a model village, well sited in the country but not too far from a town, and self-contained, with married quarters, recreation fields, shops, church, canteens and cinema [20]. Unfortunately, owing to present economic conditions, new building is severely limited for the Army as for the country as a whole, consequently many old barracks of obsolete pattern are still in occupation.

Overseas accommodation consists of permanent barracks, suitably con-

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structed for the climate, or of semi-permanent camps, hutted or partially tented, according to the expected length of stay in the area. Improvements are constantly taking place, within the limits of the financial resources available, in the design and materials of buildings, huts, tents and equipment.

Clothing and Equipment

The clothing of the Army is also undergoing continuous evolution. The South African War saw the replacement of the famous red coat by khaki. After that war a Committee considering the physiological effects of food, clothing and training on the soldier emphasized the necessity for comfort of clothing and equipment for efficiency. The 1914-1918 war led to renewed demands for functional improvements. The eventual result was battledress, which proved basically sound in the last war. Some radical changes took place, not without misgivings in certain quarters ; for instance, puttees were discarded to permit freer circulation in the legs, the hard cap was replaced by the forage cap and beret, and early in the war enlightened conceptions of the effects of heat led to the abolition of that symbol of service east of Suez—the sun helmet.

The soldier's clothing must satisfy a number of requirements : it must be warm but at the same time permit gradual loss of excessive body heat ; as light as possible because heavy loads have often to be carried over long distances; small in bulk for ease of packing and to hamper movement as little as possible; comfortable, uniform and hard-wearing. Moreover, it must be easily and cheaply produced from freely available materials in large quantities and a wide range of sizes. A smart appearance is important for ceremonial wear, while utility and inconspicuousness are essential for active service. In any future atomic war a low flash point will be an important requisite. Further requirements are protection of the body from injury by trauma, insects and snakes, prevention of skin afflictions, heat stroke and exhaustion in hot climates, and of frostbite and allied conditions in cold.

For general purposes in temperate and cold climates *wool* has proved the best material so far available—it retains heat, absorbs water rapidly and loses it slowly, thereby preventing sudden chilling. Irritation of sensitive skins is minimized by mixing a proportion of cotton with the wool of the Army shirt, while retention of heat and ventilation of the skin are further assisted by underwear of cellular mesh material. But present world demands for wool are exceeding supply, nor is it ideal from the point of view of weight and bulk, hence its use is likely to be partially superseded by such material as *proofed gaberdine* for active service garments, and eventually perhaps by *synthetic materials* for formal uniform. A new type of combat suit has, in fact, been designed, consisting of a proofed gaberdine smock based on that issued to airborne troops during the war, and trousers of similar material. This is claimed to meet many of the requirements mentioned above, but has not yet undergone sufficiently extensive trials for an opinion to be expressed.

In the design of tropical clothing a balance must be struck between such factors as short trousers and open-weave material for comfort and coolness on

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the one hand, and long trousers and close-weave material for protection from injury and mosquitoes on the other. In this respect it is interesting to note that the British Army has worn short trousers in the tropics for many years, while the United States Army is resolute in its preference for long. Certainly, such afflictions as desert sores are more prevalent on unprotected skin, and medical opinion generally now seems to be in favour of the abolition of shorts altogether. Similarly, until anti-malarial protection can be assured by other means—by drugs, for instance—close-weave material would appear to be essential in malarious areas ; in other words, in most tropical countries in which the British Army is serving today.

The soldier's footwear is of prime importance. Little change has taken place for many years in the design of the Army boot, which, though satisfactory in many respects, is heavy, expensive and not permeable to moisture. Nor is the anklet entirely satisfactory. Suggestions have been made that the two should be combined in the form of a knee-boot, but this would be expensive and leather is scarce. Whatever form is eventually adopted will probably be of composition, having an impermeable sole and semi-permeable uppers to allow adequate ventilation of the feet.

Improvements have also taken place in the design of load-carrying equipment, the aim being to distribute the weight as equitably as possible with least hampering of physiological function, at the same time preserving a small silhouette. The chief disadvantage of previous patterns was the tight waist-belt which, with ammunition pouches in front of the chest, impeded full respiratory movement. A new pack has now been produced, of which most of the weight is carried on the hips, and the front of the chest is left free. Nevertheless, the total weight of a man's load in full marching order is still as much as 78 lb. No reduction can be accepted by the Operational Staff in the variety and number of items carried, and so economies can only be effected by reductions in their weight. Thus steel and enamelled iron have now been replaced by aluminium for mess-tins and water-bottles, the steel helmet is being ousted by a lighter one made of a new plastic, while a still more fruitful field for investigation is the composition of ammunition casings, which are the heaviest individual items of the soldier's load.

Food

At the beginning of this century the soldier's ration consisted of bread and meat, with a cash allowance of threepence per day for other items [21]. Even this was often badly cooked and hence not fully consumed. No attempt was made to estimate the soldier's nutritional requirements scientifically until 1909. By 1914 the daily ration theoretically yielded 4,500 calories, but the incidence of scurvy and beriberi overseas in 1913, and later in Gallipoli and Mesopotamia, are proof of its deficiencies. Extensive research on vitamin B_1 at the Royal Army Medical College and the Lister Institute led to the issue of Marmite to troops overseas, and the same workers also discovered an efficient method of preserving the antiscorbutic properties of lemon juice. Cathcart and Orr, assisted by

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officers of the Royal Army Medical Corps, carried out research into the energy expenditure of the soldier, while Plimmer painstakingly compiled his tables of food values. Thus in the post-war period adequate scientific data were available for the calculation of dietetic requirements, and knowledge of the vitamins was growing. The appointment of an inspector of Army Catering encouraged adequate cooking and attractive serving of food, and consequently greater consumption. Continued research between the wars led to an ample and varied ration in all theatres in 1939-1945, with almost complete absence of nutritional deficiency.

The essential requirements of an Army ration are the provision of the proximate principles in their correct proportions in sufficient amount to replace the energy expended by the soldier, including a sufficient supply of all items essential to health, which must be digestible, varied and properly cooked and served, having due regard to economic requirements and local availability [22]. The satisfactory fulfilment of these requirements presupposes a knowledge of "the energy expended by the soldier" ; once this is known the remainder present no great difficulty. The relevant factors will now be briefly discussed.

The researches of Cathcart and Orr during the 1914-1918 war indicated a daily energy expenditure by adult British recruits in training of about 3,574 calories [23]. Since then the tempo of training has increased, with a proportionately higher expenditure. Furthermore, the bare replacement of energy expended allows no reserves to be built up, which may well be required under active service conditions. A joint report of the Ministry of Health and the British Medical Association Nutrition Committee in 1934 suggested that a man doing heavy work should receive 3,400 to 4,000 calories daily [24], while in 1941 the Committee on Food and Nutrition of the National Research Council, U.S.A., advocated an optimum intake standard of 4,500 calories for an adult man of average size doing hard or very hard work [25]. The minimum intake standard now advised by most authorities appears to be about 4,000 calories for an active occupation. It is difficult to arrive at an exact conclusion in the face of so many conflicting recommendations, but a minimum field service or training ration standard of 4,200 calories would appear to be a reasonable proposition, especially when it is remembered that half of the modern Army are under twenty years of age, and that the majority of recruits are young men in their teens, many of whom arrive in the Army in an undernourished state.

The present Home Service ration scale, owing to the general food shortage, falls far short of this requirement. It should be explained that the majority of the items are issued in kind, with a small per capita cash allowance to the Unit to provide variety—the purchasing power of which must decrease with the rising cost of living. Additional rations are issued to Training Units and certain other categories, but even these bring the total only to the optimum level for a sedentary worker. Moreover, the ration is calculated on the assumption that the soldier purchases privately about 300 calories daily in other words, that he must spend over one shilling of his daily pay on essential food, an assumption which, it is submitted, is fundamentally unsound, as an obligation surely rests with the

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State to provide a full and complete ration. Foreign Service rations are adequate ; it is to be earnestly hoped that the Home Service scale will be brought into line as soon as conditions permit.

Water

The provision of an abundant safe water supply is, as in civil life, a responsibility of the Engineers, who are advised on quality by the Medical authorities. In this country, of course, the Army obtains its water almost entirely from local public mains ; but in many areas overseas it has to make its own arrangements. The basic principles of clarification followed by sterilization are applied in all cases, from large static installations to individual methods for small isolated detachments. In the former case clarification is effected by large metal kieselguhr filters, delivering 12,000 gallons per hour, or by sand filters delivering up to 30,000 gallons per hour ; chlorine gas is the sterilizing agent in both methods. Large-scale mobile equipments, such as the Elliott Mobile Water Purifier, employ chloramination, by electrolysis of a weak solution of sodium chloride to which an ammonium salt is added. The resulting ammonia-chlorine is more persistent than chlorine alone, tastes less and is barely deviated by organic matter in the water, but is slower in its action [26]. Field units are equipped with water trucks of up to 350 gallons capacity, in which, after clarification by Stellar or Meta filters, chlorination is effected by the addition of water sterilizing powder—bleaching powder incorporating quicklime for increased stability. The amount of powder to be added for effective sterilization can be estimated by means of a simple test, using cadmium iodide and starch indicator, devised by Sir William Horrocks in the First World War.

The necessary apparatus is carried in a small case on the water truck, and any moderately intelligent man can be quickly trained in its use. Small quantities of water, in situations where individual sterilization is the only feasible method, are filtered through the Millbank bag of chain-weave cloth impregnated with anti-mould composition. Superchlorination is then effected in individual water-bottles by adding Halazone tablets, which are followed after a suitable interval by sodium thiosulphate tablets to remove the chlorine taste.

It is apparent from the foregoing account that wherever water is available it can be made safe for human consumption ; risk of contracting water-borne disease has been reduced to the minimum compatible with employment of the human element.

Personal Cleanliness

Little need be said under this heading, except that the maintenance of a high standard of personal cleanliness by any body of men depends upon

(1) the provision of adequate facilities for bathing, ablution and laundry, and
(2) ensurance of their use by the men.

The former are usually available, though not always in such abundance as thought necessary by the hygiene specialist. With regard to the latter, there are two lines of approach to the problem. Ideally, the aim would be achieved through Health

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Education ; in fact, expedience entails recourse to disciplinary measures—orders, parades, inspections—in the present absence of popular enlightenment. Advancement of knowledge will result in a correct balance being struck between the two.

Physical Development

The attainment of physical fitness is a *sine qua non* of positive health. It is achieved in the Army largely through physical training. Just as the soldier's food has progressed from bully beef and biscuits to the modern balanced ration, so also have up-to-date methods of physical education been adopted by the Army and modified to its special requirements. Gone are the days of "physical jerks," to be replaced by systematic scientific training designed to develop anatomical, physiological and psychological fitness in the recruit, and to maintain it in the trained soldier.

Three different types of physical training are at present in use. Basic training aims to improve the poor musculature of the average recruit, who spends about ten periods at each of six standard progressive lessons. About the middle of this course he undergoes the recruits' test to determine his progress ; towards the end he takes the standard test. Battle training is a progression designed to fit the trained soldier to the physical duties of his Arm in battle, for which appropriate activities can be selected from a wide syllabus, culminating in battle physical efficiency tests. The third type, games training, is suitable for the trained soldier as an alternative to battle physical training in peace time. Either the standard or battle tests should be done annually by all trained soldiers, and every encouragement is given to all ranks to take part in games and sports. Organized games and physical training are directed and taught by the Army Physical Training Corps, in close liaison with Army Physical Medicine Specialists.

Working Conditions

Many of the trades of the modern Army—in workshops, bakehouses, Ordnance depots, and so on—are precisely similar to their civilian counterparts, and are subject to the same occupational hazards. In such establishments in the United Kingdom the requirements of the Factories Acts and other legislation governing working conditions—heating, lighting, ventilation, safety precautions, etc.—are carefully observed, but such cannot always be the case on active service. While this is accepted as an additional occupational hazard of the soldier's profession, it should be insured against as far as possible by building up the tradesman's fitness and bodily reserves by attention to physical training, feeding and other aspects of his environment. As for the ordinary soldier—infantryman or gunner, tankman or sapper—it must always be borne in mind that his normal duties and training necessarily involve much physical discomfort, and therefore it is important that his surroundings be made as congenial as conditions permit during his off-duty hours.

Recreation : Morale : Mental Health

These three factors are discussed under one heading because they are closely linked. High morale is a state of mind, a condition of physical, mental and

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spiritual well-being, brought about in the individual by absence of frustration, freedom from worry, confidence in himself and his associates, awareness of his ability, a feeling of worth and being wanted. It may be acquired, in the Army, first, through skilful training—training until the man is at the peak of his form, both in physical fitness and in the mastership of his trade ; secondly, through "man management," an ill-defined process compounded of leadership, discipline, *savoir faire*, power, understanding, coming naturally to the born leader, differentiating the good officer from the indifferent. The fruits of wise man management are exemplified by the conduct of the Brigade of Guards and the Airborne Divisions in many trying situations during the last war.

No troops, however, can be maintained indefinitely at the peak of their form without outside interests. Boredom creeps in, morale deteriorates, the tensions of frustration are discharged through undesirable channels, reflected by a rise in minor sickness, venereal disease and psychological illness rates. Hence the necessity for adequate recreational facilities and welfare amenities ; playing fields, sports equipment, hobbies, clubs, canteens, cinemas. Welfare organizations, such as NAAFI and the many voluntary bodies, render valuable service in this respect. Even in this country military centres are frequently well away from towns of any size, while overseas the soldier is still further from his accustomed environment. Other important contributory factors are links with home in the form of regular mail, newspapers and wireless broadcasts, and, above all, leave. Finally, the spiritual aspect should not be overlooked : good chaplains have time and again proved their worth in uplifting individuals and group morale.

Dental Care

The provision of efficient dental care is no less important for the promotion of health as for the treatment of oral complaints. The Army has for many years provided free treatment necessary to maintain the dental efficiency of soldiers, "of a conservative nature and mainly directed towards the prevention of the necessity for artificial dentures" [27]. Before the advent of the National Health Service the privilege was also extended to Regular soldiers' wives and families, but since then this commitment has been transferred to the civilian Service, except in the case of families overseas. It is laid down that Dental Officers will instruct soldiers in oral hygiene, both by lectures and by demonstrations to individuals when they come up for inspection or treatment, and that all soldiers will have an annual dental inspection [28]. The Royal Army Dental Corps, a branch of the Army Medical Services, operates centres at all military stations and Dental Departments in military hospitals. The dental condition of each recruit is recorded on his Medical History Sheet, and full particulars of periodic inspections and treatment are noted on a Dental Treatment Card which accompanies the soldier from one station to another throughout his service.

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[*To be continued*]

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To PRIVATE SECRETARY TO HER MAJESTY
THE QUEEN, BUCKINGHAM PALACE.

Director-General and all ranks Royal Army Medical Corps send their humble duty to their Colonel-in-Chief and respectfully offer her their deepest sympathy on the passing of His Gracious Majesty The King.

To DIRECTOR-GENERAL, ROYAL ARMY MEDICAL CORPS, WAR OFFICE, S.W.1.

I am sincerely grateful for your message. Please assure all those for whom you speak that I deeply value their kindness and sympathy.

ELIZABETH R., *Colonel-in-Chief.*

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Clinical and Other Notes

I—BRUCELLOSIS

AN ACCOUNT OF THREE CASES TREATED WITH CHLOROMYCETIN AND AUREOMYCIN

BY

Major R. G. MACFARLANE
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BRUCELLOSIS is a specific infection of man and animals produced by *Brucella abortus*, *Br. melitensis* and *Br. suis*. It occurs in acute and chronic forms. The acute form is characterized by remittent fever which may exhibit a series of relapses with brief apyrexial intervals. The disease occurs in most parts of the world. Here in Malta it is still common among the indigenous population, but it is now rare for British service personnel to contract the disease.

The clinical characteristics vary with the type of infection, but that caused by *Br. melitensis* tends more often to produce the prolonged relapsing type of fever which has caused the disease to be called undulant fever. The clinical characteristics even in the *Br. melitensis* group vary enormously, as the three following case reports demonstrate.

Case 1.—C. V., aged 16, son of Gunner V., of the Royal Malta Artillery. This Maltese boy was admitted to hospital on 21st February, 1950, with a history of having had undulant fever in July and August, 1949. He had apparently made a slow recovery from this illness, but had been able thereafter to return to a normal mode of life. Two weeks before admission he began to have severe pain in the right knee and hip joints. The pain had become less since its onset and the knee joint was less troublesome than the hip. He had no other symptoms. On examination he was found to have a temperature of 100° F. He was noted to be thin, pale and undernourished. No tenderness was elicited in the abdomen, but the spleen was palpable two finger-breadths below the costal margin. There were no abnormal physical signs in the respiratory, cardiovascular, central nervous or genito-urinary systems. Examination of the legs showed marked tilting of the pelvis to the right with limitation of movement of the right hip joint on flexion, extension, and both internal and external rotation. Pain was elicited on movement of the joint. The right knee was apparently normal.

Clinically the case was one of brucellosis with involvement of the right hip joint.

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The diagnosis was confirmed by the agglutination reaction of the patient's serum which with *Br. melitensis* went to a titre of 1 in 1,250.

The Mantoux reaction was negative. X-ray of the hip joints showed that there was a slight increase in the width of the joint spaces with a definite circumscribed osteoporosis in the region of the acetabula ; the appearance was strongly suggestive of a bilateral infective arthritis.

The patient continued to run an irregular fever and on the advice of the Surgical Specialist the right hip was encased in a plaster-of-Paris spica. In this he was more comfortable and his general condition improved a little, although he continued to run an irregular fever.

In May, 1950, some chloromycetin was received and the patient was given an initial dose of 2 grammes, followed by 0.5 gramme every six hours. After he had had 15 grammes his temperature fell for the first time in weeks, but the period of apyrexia was short-lived. It was clear, after 31 grammes of chloromycetin had been given, that no appreciable benefit had accrued from its use. The spleen was still palpable and the patient's temperature was still above normal. At the end of the course of treatment the plaster-of-Paris hip spica was removed and it was apparent that there was a collection of fluid in the right hip joint. Furthermore, X-ray of the joint showed that there was osteosclerosis of the head of the femur due to avascular necrosis. From now on it was necessary to aspirate the right hip joint at weekly intervals whilst maintaining skin traction on the leg. Approximately 100 c.c. of turbid, and later blood-stained, glairy fluid was aspirated each week. The fluid gave an agglutination reaction with *Br. melitensis* to a titre of 1 in 1,250. This continued throughout the summer months ; the patient's general condition improved but little and he continued to have an irregular fever. In September, 1950, a supply of aureomycin was received. In spite of a large dose of this drug (41 grammes in all) little improvement ensued. Fluid was still collecting in the right hip joint, the patient was pyrexial, and his spleen was still palpable. Six weeks after cessation of treatment with aureomycin, fluid stopped collecting in the right hip joint ; simultaneously the patient became apyrexial, and his general condition began to improve. More active treatment for the joint was begun, and in February, 1951, there had been a considerable general improvement, although much more care and orthopædic treatment will be required before the condition of the hip joint can be called satisfactory.

Chloromycetin and aureomycin had no appreciable effect on this chronic case of brucellosis in contrast to the results reported below in acute cases.

Case 2.—Sapper B., aged 29, a Maltese soldier, who habitually drank raw goats' milk, was admitted to hospital on 24th May, 1950, complaining of fever, headache, and occasional rigors for fourteen days.

On examination he was noted to be febrile, but apart from this no abnormal signs were elicited. The liver and spleen were not palpable. Investigations carried out showed no notable changes in the R.B.C. or W.B.C., but the E.S.R. was 20 mms. fall in one hour. Blood culture on 28th May, 1950, was sterile, but when repeated on 16th June, 1950, *Br. melitensis* was grown. This confirmed the diagnosis which had been obvious when it was shown on 28th May, 1950, that the patient's serum agglutinated a suspension of *Br. melitensis* to a titre of 1 in 500.

The patient was given a course of chloromycetin thus : 3 grammes initially followed by 0.5 grammes every six hours. He received a total of 31 grammes. He became apyrexial and symptom free forty-eight hours after beginning treatment. He has remained well ever since and now, after fifteen months, has not had a relapse.

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Case 3.—T. C., aged 13, son of Gunner C., R.M.A. This Maltese boy was admitted to hospital on 19th June, 1951, with a history of abdominal colic and fever of one month's duration. On admission he was febrile and the spleen was palpable two finger-breadths below the costal margin.

Blood: Hb—90 per cent. (Sahli)
R.B.C.—4.840.000/cu.mm.
W.B.C.—6000/cu.mm.

Neutrophils	48 per cent.
Lymphocytes	48 per cent.
Monocytes	3 per cent.
Eosinophils	1 per cent.

Agglutinations with *Brucella* were positive to a titre of 1 in 250. Blood culture was sterile.

Treatment with aureomycin was begun on 22nd June, 1951. He was given 250 mgm. every six hours. The temperature fell by lysis and was normal forty-eight hours after treatment was begun. He had 11 grammes of aureomycin in all. The spleen diminished in size and was impalpable at the end of treatment. He was discharged from hospital on 5th July, 1951. He was readmitted on 31st July, 1951, with four days' history of fever. The spleen was again palpable two finger-breadths below the costal margin. Agglutinations with *Brucella* were positive up to a titre of 1 in 200.

This time the temperature settled spontaneously and the spleen became appreciably smaller, but after five days he again developed a high temperature and the spleen was again enlarged to two finger-breadths.

A second course of aureomycin was begun on 5th August, 1951, and the temperature became normal thirty-six hours after treatment was begun. The spleen became impalpable six days later.

In this case the response to aureomycin in two occasions was dramatic, but relapse occurred within a month of the first course.

Discussion on Treatment

Until chloromycetin and aureomycin were discovered the treatment of brucellosis can only be described as unsatisfactory. The sulphonamides (alone or in combination with streptomycin) had proved helpful in certain cases, but they could not be relied upon. Treatment was therefore almost entirely supportive and symptomatic.

Chloromycetin

In 1947 chloromycetin, a new antibiotic, was obtained from cultures of the species *Streptomyces venezuelæ* (Ehrlich *et al.*, 1947), and is now also prepared synthetically. It was demonstrated to possess antimicrobic effects against certain Gram negative organisms, including the *Brucella* group.

Woodward *et al.* (1948) treated nine cases of brucellosis with chloromycetin. Six of the cases were experiencing an attack, whereas the other three showed a relapse of fever two, three and five months respectively after the primary illness had been treated with streptomycin and sulphadiazine. The results were

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striking. The mean duration of fever prior to treatment in the nine treated patients was thirty days. Within thirty-six hours after the start of the specific treatment, two who were more seriously ill were resting more comfortably, and the other seven patients experienced an immediate improvement of the body and joint pains. The mean duration of the fever after beginning chloromycetin treatment was 2.7 days and the temperature remained normal thereafter. Splenomegaly, which had been noted in seven of the cases, disappeared either during treatment or very shortly afterwards. There was one relapse thirty-one days following discontinuance of chloromycetin, but prompt clinical response was obtained when chloromycetin was readministered. There were no complications.

Knight *et al.* (1949) had a similar experience when treating twelve cases of brucellosis. They found that relapses were not uncommon following short periods of therapy with chloromycetin, and that relapse occurred within six weeks of the cessation of therapy in five of the twelve cases.

Later, Ralston and Payne (1950) reported on 41 cases treated with chloromycetin. Of these, 28 (70 per cent.) were completely relieved or much improved, 7 (17 per cent.) were partially relieved, but no improvement was apparent in 5 (12.5 per cent.).

In Woodward's (1948) series the régime adopted was empirical and based upon prior experience in scrub typhus and typhoid fever. The initial dose, based on 50 mgm. kilo body-weight, was adhered to, and the subsequent dosage was 0.25 gramme given every three hours until at least five days of normal temperature ensued. The antibiotic was tolerated well orally and no clinical evidence of toxicity was noted.

In Ralston and Payne's series the dosage varied between 18 and 27 grammes by mouth in seven to twelve days, using a dosage schedule very much like that used in Woodward's series.

Aureomycin

Aureomycin was first isolated by Duggar (1948) from the mould *Streptomyces aureofaciens*. Its *in vitro* and *in vivo* range of activity approximates very closely to that of chloromycetin. Bryer *et al.* (1948) demonstrated its *in vitro* activity against *Brucella*. Woodward (1949), reporting on the therapeutic results of aureomycin on brucellosis, found that the response to treatment closely followed that observed with chloromycetin. The drug was given orally. The dosage schedule used was 1 gramme initially, followed by 0.5 gramme every four hours for three days, and then 0.5 gramme every six hours for an additional five to eleven days. The average total dose per patient was 21.99 grammes given over a period of 11.6 days. No clinical evidence of toxicity was observed apart from nausea and occasional vomiting and diarrhœa. There were no complications and no relapses in five treated cases after a minimum period of two months. Spink *et al.* (1948) report on a larger series of cases treated in Mexico. Of 24 patients with *Br. melitensis* infection there was a rapid response to aureomycin in all, but three later relapsed.

The results of treatment of brucellosis with chloromycetin and aureomycin, while not always entirely satisfactory, are, by far, better than with any previously

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tried form of therapy. Chronic brucellosis is less likely to respond than the acute form. Much remains to be done in the field of prevention before the disease is eradicated.

SUMMARY

Three cases of brucellosis are described. One, a chronic case, did not respond either to chloromycetin or to aureomycin. The second, acutely ill, made a good recovery on chloromycetin, while the third responded to aureomycin, although relapse occurred after the initial course of treatment.

The treatment of brucellosis with chloromycetin and aureomycin is briefly reviewed.

I wish to thank Lieut.-Colonel H. C. Benson, R.A.M.C., O.C. David Bruce Military Hospital, Malta, for his helpful suggestions and Colonel T. B. H. Tabuteau, *O.B.E.*, D.D.M.S., Malta Garrison, for permission to publish.

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II—DIVERTICULUM OF THE STOMACH

BY

Lieut.-Colonel D. WRIGHT, D.S.O., M.B.Glasg., F.R.C.S.Ed.
Royal Army Medical Corps; Adviser in Surgery, B.T.A.

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Royal Army Medical Corps; Radiologist, B.M.H., Klagenfurt

IT has been estimated that the stomach accounts for about 3 per cent. of all diverticula from the gut, and that of these a large proportion are symptomless and have only been incidental findings during a barium meal or a laparotomy. Occasionally a diverticulum may result from ulceration or degeneration in myomata or other tumours, but the great majority are autonomous and are of three types—congenital, traction and pulsion.

Walters considers that all true diverticula, in which all layers of the gastric wall are intact, are caused by malformations or by arrested development during fœtal life, and he maintains that there is no evidence of organic disease as a causative factor.

Keith is of the opinion that a localized congenital weakness of the muscular

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wall is an important predisposing factor and that these are apt to occur close to the œsophageal opening and to the pylorus. The commonest site is on the lesser curvature close to the œsophagus.

The present case is considered worthy of publication because of the interesting radiograms and also because of the existence of symptoms which were relieved by surgical removal of the lesion.

Lajös P., an ex-officer of the Hungarian Army who had been employed as a mess-waiter in this hospital since the war, gave a history of pain and indigestion of some five years' duration. The pain was high in the epigastrium and came on soon after every meal, being worse after fatty or spicy foods. There were no intermissions and the intensity of the pain varied from slight to severe. Alkalis gave him some relief, but he had not found any drug to be wholly satisfactory

Fig. 1.

Fig. 2.

although he had undergone several courses of treatment for ulcer, with temporary improvement.

A barium meal was performed on 17th November, 1950, and the œsophagus was shown to be normal. The stomach showed a cup-and-spill deformity, the œsophagus entering near the apex of the cup. From the apex of the cup hung a large irregular diverticulum with an attenuated stalk (Figs. 1 and 2). There was constant spasm in the region of the pyloric antrum, which suggested the presence of an irritant lesion although no ulcer crater could be demonstrated. A film taken four hours after the meal showed that both the stomach and the diverticulum were empty.

On 20th November, 1950, the abdomen was opened through a high left paramedian incision. The diverticulum could not be seen, but the scar of an apparently healed ulcer was found on the front of the antrum towards the lesser

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curvature. The gastro-splenic omentum was then opened and the fundus turned forwards and downwards to expose the posterior wall. The diverticulum was found arising from the lesser curvature very close to the œsophagus. The neck was surrounded by areolar tissue and the ramifications of the left gastric vein. It was cleared by gauze dissection, clamped and excised. The stump was oversewn and inverted. After repairing the omentum the scar on the antrum was excised locally.

Post-operative recovery was uneventful and he gradually returned to a normal diet. At first he had some indigestion, but this gradually subsided over a period of about two months. The patient has now emigrated to the U.S.A., and on 10th September, 1951, he reports that he is free of symptoms.

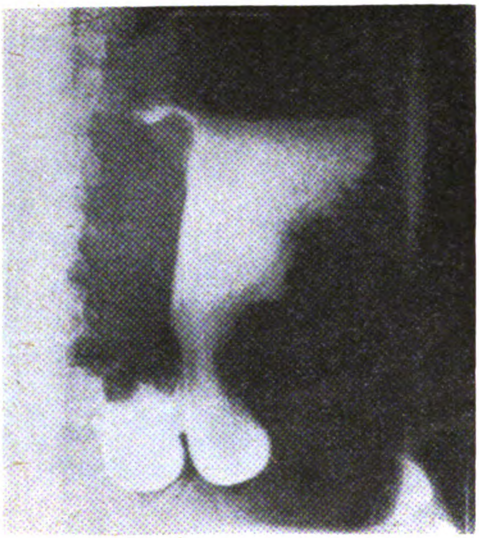

FIG. 3.

FIG. 4.

A post-operative barium meal was given on 16th February, 1951. The cup-and-spill deformity was no longer evident, only a small ledge at the terminal end of the lesser curvature persisting. No evidence of the diverticulum could be detected, but there was still considerable spasm of the greater curvature above the prepylorus which could be abolished by palpation. The pyloric antrum filled and held the meal normally. A film taken four hours later showed that the stomach had emptied (Figs. 3 and 4).

The diverticulum and the ulcer scar have been examined by Major A. Currie, D.A.D.P., who reports : "The diverticulum presents the appearances of chronic atrophic gastritis. The other specimen is a simple healing peptic ulcer and there is no evidence of malignancy in the several sections examined."

We have to thank Colonel W. A. R. Ross, D.D.M.S., B.T.A., and Lieut.-Colonel R. Johnston, Officer Commanding B.M.H., Klagenfurt, for permission to publish this case.

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Matters of Interest

NOTES FROM A.M.D.

BY OUR SPECIAL CORRESPONDENT

DURING an examination of some old documents a few days ago we came across an Army Form dated 1888. It was used for the medical examination of recruits for the Regular Army. In those days, seven years with the colours and five with the reserve was known as a short service engagement. We give below an extract of this Army Form.

CERTIFICATE OF PRIMARY MEDICAL EXAMINATION
(*By a civilian Medical Practitioner*)

I have examined the above-named Recruit and find that he does not present any of the following conditions, viz.:

Scrofula; phthisis; syphilis; impaired constitution; defective intelligence; defects of vision, voice or hearing; hernia; hæmorrhoids; varicose veins beyond a limited extent; marked varicocele with unusually pendent testicle; inveterate cutaneous disease; chronic ulcers; traces of corporal punishment, or evidence of having been marked with the letters D., or B.C.; contracted or deformed chest; abnormal curvature of spine; or any other disease or physical defect calculated to unfit him for the duties of a soldier.

He can see at the required distance with either eye, his heart and lungs are healthy, he has the free use of his joints and limbs, and he declares he is not subject to fits of any description.

I consider him fit for service in the Army.

—— ——, *Civil Medical Practitioner.*

Why, we wonder, might the intending soldier bear evidence of having been marked with the letters D., or B.C.? Possibly D. was the letter used to brand deserters. But what about B.C.? Perhaps one of our readers with a knowledge of military history can enlighten us.

THE following appointments have recently been announced: Brigadier A. Sachs is appointed Honorary Physician to the King, 9th November, 1951, *vice* Major-General Tomory. Major-General J. C. Collins is appointed Honorary Surgeon to the King, 14th December, 1951, *vice* Major-General Macfie.

From the Army List, we learn that Brigadier J. C. Collins and Brigadier A. G. Harsant are both promoted to Major-General from 13th December, 1951, and Colonel F. C. Hilton-Sergeant was promoted Brigadier from 8th November, 1951.

THERE have been some changes in B.A.O.R. since we gave the names and appointments of senior officers there. Since writing our contribution to the September number, H.Q. 7 Armoured Division, where Colonel J. W. Eames is still A.D.M.S., has moved to Verden. Colonel R. E. Waterson is acting O.C. British Military Hospital, Hannover, now that Colonel T. J. Ryan has left there.

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Lieut.-Colonel C. W. Maisey has left H.Q. 2nd Infantry Division to command 28 Field Ambulance. Colonel J. C. Barnetson has taken up an appointment with S.H.A.P.E. in Paris, and Colonel P. T. L. Day has been posted to relieve him as A.D.M.S., 11 Armoured Division. 28 Field Ambulance was until recently commanded by Lieut.-Colonel D. A. O. Wilson, whose untimely death as the result of an accident was announced a few weeks ago.

MAJOR-GENERAL J. M. MACFIE, *C.B.*, *C.B.E.*, *M.C.*, late R.A.M.C., retired on 10th January, 1952. He was commissioned in 1915 and went to serve in the Army of the Black Sea, where he held a number of junior administrative medical appointments. He returned to the United Kingdom in November, 1921, but later returned to G.H.Q. the Army of the Black Sea, which he finally left in 1923. After two years in the United Kingdom he went out to India, and remained there until April, 1931. In August, 1932, he was appointed D.A.D.G., A.M.D.2, and at the end of 1936 he embarked for Egypt to take up the appointment of D.A.D.M.S., H.Q. B.T.E. Soon after the war broke out he became D.A.D.M.S., and then A.D.M.S., G.H.Q. Middle East. He remained there throughout the difficult years of the war in the Middle East, and returned to the U.K. in March, 1943. He went then to the War Office again, as A.D.G., A.M.D.1. After two months he was selected for the appointment of D.D.G.A.M.S. (Admin.), with the acting rank of Brigadier. After three years in this appointment he went out to Nairobi to become D.D.M.S., East Africa Command. In the same year he was promoted to the rank of Colonel. In 1949 he returned home to take up the appointment of D.D.M.S., Scottish Command. At the end of that year he went for three months to the Royal Army Medical College as Commandant and Director of Studies. After this short period he went to Western Command as D.D.M.S. and shortly afterwards was promoted Major-General. It was from this appointment that he has now retired.

In 1917 Major-General Macfie won the Military Cross. He was awarded the O.B.E. in 1941, and promoted to C.B.E. in 1946. In June, 1951, he received the C.B. He was Mentioned in Despatches in 1917 and 1944. In March, 1950, he was appointed Honorary Surgeon to the King.

Extracts from the "London Gazette"

4.12.51 *R.A.M.C.*

Major F. McKibbin, *O.B.E.*, M.B. (8445) (Ret. Re-employed) reverts to ret. pay and is restored to the rank of Col. on ceasing to be re-employed 1st Dec., 1951.

11.12.51 Col. (temp. Brig.) Albert Sachs, M.B. (36785), late R.A.M.C. is appointed Honorary Physician to The King, 9th Nov., 1951, *vice* Maj.-Gen. Kenneth Alexander MacDonald Tomory, *C.B.*, *O.B.E.*, M.B. (8118), retd.

19.12.51 Colonel E. J. S. Bonnett to H.Q. Eastern Command as Deputy Director of Army Health.

Colonel R. A. Austin from H.Q. Eastern Command to be President of the Special Standing Medical Board (Attached Q.A. Military Hospital).

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Book Reviews

ORTHOPÆDIC SURGERY, 4th Edition. By Walter Mercer, Ch.B., F.R.C.S.(E). Edward Arnold & Co.

The previous editions of this well-written, readable book have been of proved value to the medical student and to the apprentice to orthopædic surgery. It is organized along pathological lines and the section on the metabolic and congenital defects of the bone, arthritis, affections of the spine, intervertebral disc lesions and the complications of trauma have been completely revised to increase this edition to 1016 pages as compared with 947 pages in the previous edition.

The new edition is up to date and reflects the Edinburgh School on Orthopædics. Most surgeons would wish to have this book in their library.

C. M. M.

ANY QUESTIONS? A Selection of Questions and Answers published in the *British Medical Journal.* 1st Series. London: British Medical Association. 1951. Pp. xii + 240 (+ xvi pp. of advertisements). 7s. 6d.

This is a selection of questions, posed by general practitioners and answered by experts, from the eight-year-old series in the *British Medical Journal.* It contains 192 short articles covering a wide range of topics: treatment, from nitrogen mustard for lymphadenoma to rebreathing from a paper bag for hiccup; a variety of dietetic instructions; such conditions of military interest as sprue, undulant fever, worms and tinea; a clear note on hereditary disabilities; utilities—embalming and fruit—preserving; curiosities—the latest recorded age for conception, the biggest baby (the R.A.M. College specimen appears to be *proxime accessit*) and leopard-men of Nigeria. The book is very good value.

J. B. N.

BENTLEY AND DRIVER'S TEXT BOOK OF PHARMACEUTICAL CHEMISTRY. Revised by J. C. Driver. 5th Edition. Geoffrey Cumberledge. Oxford University Press. 1951. Pp. viii + 671. 32s. 6d.

Dr. Driver has arranged this book in a systematic order for easy reference; as far as possible the different sections have been made independent of one another so that the book may be equally useful to the various schools whatever their methods of teaching. He advises that the book must be read in conjunction with the British Pharmacopœia and that a knowledge of elementary chemistry is necessary.

The contents include a section on analytic methods, another on the inorganic

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compounds in the B.P., followed by a very large one on organic medicinal chemicals. Miscellaneous appendices give analytical tables for identifying chemicals and other useful data.

As would be expected, the book is well written, very readable and free from major errors, but one misses any mention of Paludrine, B.A.L., Hetrazan, para-amino-salicylic acid and other modern pharmaceuticals. The tests given for chemicals are rather on the classical side ; for example, the sodium di-ethyl thiocarbamate test for copper is omitted and the cobalt acetate-isopropylamine test for barbiturates could not be found.

In spite of these omissions, the book has obviously proved and will, no doubt be in the future, of great use to students working for the various examinations of the Pharmaceutical Society. S. E.

HANDBOOK OF SURGERY. Ledlie and Harmer. Baillière, Tindall & Cox, 1951. 21s. net.

This is a new handbook of some 500 pages, written to present to the student and young practitioner a concise account of modern Surgical practice.

This it has achieved in respect of the student—as an easily read brief account of most Surgical disabilities, from which the student can expand his knowledge by reference to larger works. It will also be very useful for that rapid revision of the subject in the days before the examination.

It is, however, a bit superficial in places, and in the desire to be brief, impressions are left which would not satisfy an examiner, some examples of which are:

In the section on osteoclastoma there is no mention of expansion of the bone and the impression is left that it is preferable to amputate a child's leg rather than to run the risk of damaging the epiphysis by X-rays.

In filarial elephantiasis the pathology is wrong, for the multiple parasites cannot be localized or removed.

The treatment of open fractures : a depressing section, which neglects the lessons of the two world wars. The advice that secondary suture or grafting should be delayed till signs of bony union are present would not, it is to be hoped, be accepted by any examining board today.

One of the signs of a dislocation—the recognition of the end of the bone in an abnormal situation—is not mentioned ; it is usually accepted that the flaps of an amputation are better NOT stitched back ; and the advice that "the shorter the stump the better" is confusing to a student (or practitioner), when this is followed by "ideal" lengths of 10-12 and 7 inches.

Amœbic (solitary) abscess of the liver is never caused by bacillary dysentery, nor are they frequently multiple ; and the pyelogram of early polycystic disease is not typical. Metastases in lymph glands should not be described as a variety of lymphadenitis (an inflammatory state).

The authors, although indignant at official ignorance in regard to varicocele, would, however, occasionally be willing to "placate officialdom" by an operation which "even if skilfully conducted" may aggravate or worsen the condition.

A. G. H.

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Pathological Histology. Robertson F. Ogilvie. Edinburgh: E. and S. Livingstone. 4th Edition. 1951. Pp. xii + 506, with 295 photomicrographs in colour. 40s.

This, the fourth edition in eleven years, maintains the original plan of demonstrating common pathological lesions by Mr. T. C. Dodds' admirable colour-photomicrographs, supported by clear, concise descriptions of naked-eye and microscopical appearances. The result is a wellnigh perfect companion to the slide-box and textbook of the student learning or revising histopathology: the only danger is that it may come to be regarded as a substitute for them. There are flaws: the reversal of the references to Figs. 133 and 134 on p. 174, and the omission of Figs. 279 and 280 from the review copy; the cavalier treatment, now all too common, of proper names (Zondek now joins Aschheim among the misused); and the index, which shows notable omissions among many uncritically full references. But the book remains a valuable one, its usefulness enhanced by clear print and pleasant production.

J. B. N.

Fractures and Joint Injuries. By Sir Reginald Watson-Jones, B.Sc., M.Ch. (Ortho.), F.R.C.S., F.R.A.C.S. (Hon.), F.A.C.S. (Hon.). 4th Edition. In two volumes (not sold separately). £6 per set.

The demands for "this most important book on the Subject in the English Language" have been in excess of supply even from the first printing. In Volume I of this new and fourth edition much has been rewritten and many new chapters have been added. There are new chapters on shock, early closure of wounds as learned in the last war, cancellous bone transplantation, bone banks, intramedullary nail fixation, and plastic surgery in its relation to fracture treatment. The revised chapter on pathological fractures is in itself a small monograph. Material is included from recent lectures by the author (Robert Jones Memorial Lecture in the Royal College of Surgeons of England, the Hugh Owen Thomas Memorial Lecture in Liverpool, and the Robert Jones Lecture in New York).

Many references to the *Journal of Bone and Joint Surgery* are given and the book is frequently punctuated by illustrations from the Orthopædic and Rehabilitation Centres of the R.A.F.

Volume I of this new edition of this now famous reference book is an up-to-date classic studded with numerous references and written in the author's emphatic manner.

Traumatic Surgery constitutes fifty per cent. of the surgery that the surgeon in the R.A.M.C. is called upon to do and, even though the second volume might not appear for a few months, this book should be ordered for libraries in all Military Hospitals TODAY. Further, surgeons will wish to possess the set. The price is high, but then this is a first-class book, beautifully produced by the House of Livingstone.

C. M. M.

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FELLOWSHIP EXAMINATION PAPERS—ROYAL COLLEGE OF SURGEONS OF EDINBURGH: for 1947-1951. E. J. Livingstone. 5s. 6d. net.

A handy collection of papers set at examinations for the Fellowship of the Royal College of Surgeons of Edinburgh during 1947-1951.

These are printed on non-shiny paper, and are easily legible in poor lights such as those in trains and buses.

A useful volume, and one whose value would be even greater if there were included a forecast of the papers to be set in 1951-1955!

A. G. H.

THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN. Calendar 1951-1952. Pp. 308. Printed by W. Heffer and Sons Ltd., Cambridge, England. 12s. 6d.

This book gives general information about the Society, its administration and activities, details about its examinations, diplomas, scholarships, etc., and prints in full the statutes and regulations affecting the practice of pharmacy.

It should prove useful to those intending to be pharmacists and to qualified pharmacists.

It is well printed and has a very useful index.

S. E.

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Original Communications

ROCKET PROPELLANTS: THEIR TOXIC EFFECTS, HAZARDS AND FIRST AID

BY

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"The pursuit of scientific truth in which you are trained, is a grand, exacting and splendid discipline indeed. There is the acquisition of exact and precise knowledge by observation, experiment, the inspired guess, even by accident. There is the testing of it by applying it and seeing what trial and error teach you. And then out of it come fresh problems, fresh study and more truth."*

IT would be true to say that much of the work carried out in Government Establishments is of particular interest to medical officers in all three Services. In view of the large amount of scientific work which is being undertaken by the Government at the present time and the inadequate facilities for the medical profession in the fighting services and in Civil Defence to become acquainted with this work, it gives me much pleasure to accept the opportunity which your Editor has afforded me to publish this article in the columns of your Journal.

HISTORY OF ROCKETS

A few salient facts about the history of rockets will help you to assess our present state of development. Rockets are of ancient origin. History relates that the Chinese were the first to attach plain-powder rockets to feathered arrows about A.D. 1220, and about A.D. 1500 Wan Hoo, a Chinese Civil Servant, tried a manned rocket projectile and disappeared effectively in a cloud. In the Middle

* From an address given by Doctor Geoffrey Fisher, Archbishop of Canterbury, on 4th October, 1949, at the opening of the new session of the University Medical School, Birmingham.

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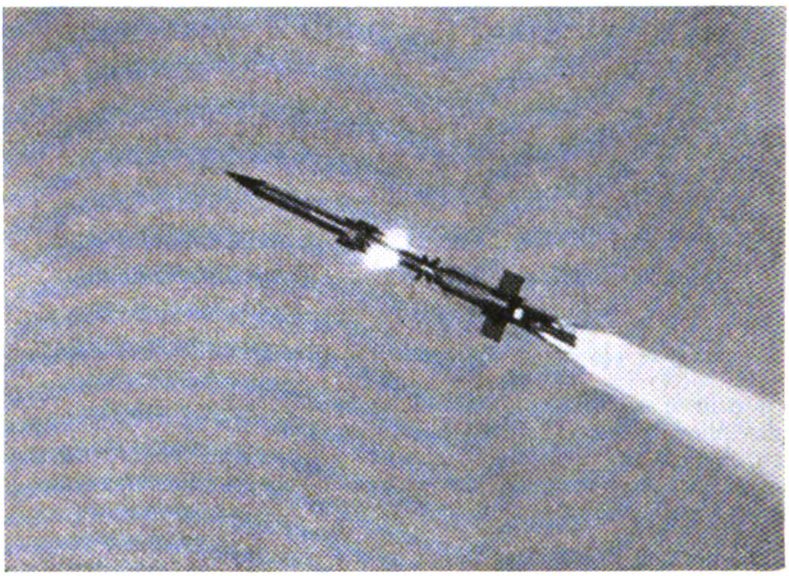
Ages rockets became quite common in addition to primitive guns, and during the fifteenth century the French used rockets against English troops. In 1688 experiments with war rockets weighing 120 lb. were carried out in Berlin. Fresh impetus was given to the use of rocket weapons after British Colonial Forces had met with severe losses in India against organized rocket troops of Tippu Sahib. The rockets employed were hollowed bamboo sticks filled with the charge and carrying some incendiary material. About 1800 Colonel Sir W. Congreve, M.A., of Woolwich Arsenal, developed new types of iron-cased, finned-stick rockets with incendiary or shrapnel war-heads, the propellant charge being, of course, gunpowder. These rockets, launched from the ground from



A Rocket in Flight.

special rocket-throwing vessels in quick succession and in large quantities, proved of immense value in the wars against Napoleon. In 1812, at the battle of Blandersburg, American militiamen broke under the fire of British war rockets and left Washington defenceless. As a result of these successes, practically all armies and navies introduced special rocket artillery detachments. The weapons used were the Congreve model, and the United States Army alone established more than ten such batteries, and in all wars up to about 1860 rockets were common as war missiles.

In 1846 the American, W. Hale, replaced the stabilizing stick by three curved vanes at the aft end of the rocket and the first spin-stabilized rocket was thus created and proved a great success. From about 1850 until about 1870 there was a decline in rocket artillery in favour of field artillery. The war-rocket came into discredit, although in Britain a spinning Hale war-rocket was still on the equip-

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ment list in 1914 and available for use with the Royal Flying Corps. So far as is known, no operational use was, however, made of this rocket for aircraft. The only use for rockets then thought practicable was for fireworks, for illumination, for conveying life-lines to ships in distress, the latter application having been originated in Prussia during the late eighteenth century. During the 1914-18 war, rockets were employed defensively against kite balloons. The rocket missiles used were rather small, were stick-stabilized and acted as incendiaries. They were carried by single-seater fighters on outboard struts and electrically fired. In one instance an allied Newport Fighter biplane equipped with incendiary rocket projectiles was able to destroy a number of German kite balloons in one operation, thus temporarily blinding the enemy. Incendiary rockets were also tentatively used against Zeppelins, but did not meet with success as their range was very limited. During the Second World War the lack of sufficient ack-ack guns compelled the War Office to use barrages of modern war rockets against enemy raiders. The Z-batteries set up met with fair success and for the first time rockets were fired operationally which burned smokeless powder propellants. This development was due to British work on explosive research and established superiority for Britain in this particular field. Rockets were also used operationally by the Germans from a chemical mortar which could throw smoke and gas missiles for relatively short ranges. In 1942 rockets were used by the Russians as armour-piercing projectiles fired by low-flying aircraft against armoured vehicles. The relief of Stalingrad was greatly aided by the use of rocket barrages. All these war rockets were unguided.

Class of Missile

Rocket-propelled units can generally be classified according to the following headings:

(*a*) Type of application—Aeroplane power plant; rocket projectile; guided missile power plant; assisted take-off unit.

(*b*) Type of propellant used—Liquid propellant; solid propellant; gaseous propellant or combination of liquid, solid and/or gaseous propellant.

Uses

There are essentially two types of jet propulsion: rocket propulsion, wherein the matter to be ejected is stored within the device and ducted; and propulsion wherein the surrounding fluid is ducted through the device and accelerated to greater momentum by mechanical or thermal means prior to ejection.

Examples of Mechanical Compression Units

Turbo Jets.—The fluid is compressed by mechanical means. It is then burned and expanded in a nozzle. This compression is usually accomplished by a mechanical compressor which is driven by a turbine (turbo jet) or other means. The momentum of the ducted fluid is increased and this produces a propulsive force.

Rocket Projectiles: (*a*) *Unguided Missiles.*—An explosive charge, a smoke

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charge or some other military payload is propelled the first part of its flight by a suitable simple rocket system. During the remainder of the flight the projectile is a freely flying body, not as accurate as artillery and small arms. Because of simplicity of rocket projectiles and light weight of launching mechanism, they can more readily be fired in greater numbers.

(*b*) *Guided Missiles.*—Similar to unguided missiles, but they are usually larger and their flight path is controlled by an automatic mechanism or pilot. Although the main application of guided missiles is a military one (German V1), they are also used as vehicles of scientific instruction. The art of warfare is now being revolutionized by the manifold application of this weapon. The weapon may be subdivided into several classes depending on their launching method and type of target, including ground-to-ground, ground-to-air, air-to-air, air-to-ground, ship-to-ship and ship-to-air missiles. The payload would be explosives, smoke or poison gases charge. It is the aim of many rocket experimenters to design a guided missile which will leave the earth. Advanced space missiles are intended for inter-planetary travel and research. It will probably take several years before this field will be accomplished. These missiles may be guided or unguided.

Many other applications of rockets can be mentioned, such as rocket-powered racing cars, rocket-driven small boats, rocket to assist heavy trucks out of mud ruts and even rocket-fired railroad cars and water rockets for torpedoes and submarines.

Having described the types, application and uses of rocket devices, the underlying principle is the same throughout—the liberation of the largest amount of heat in the shortest possible time by means of a chemical reaction, this heat being converted into momentum of the exhaust gases.

This is done by propellants—oxidants and fuels. It would be quite impossible in this paper to cover all the systems which have been used in the past and are being tested at the present time, but it is proposed to deal with a few substances—oxidants and fuels—which are in constant use in this country. These have been selected by virtue of their somewhat differing toxic properties. These systems include : Nitric acid (oxidant) and kerosene (fuel) ; hydrogen peroxide (oxidant) and C-fuel (fuel) ; hydrogen peroxide (oxidant) and kerosene (fuel) ; liquid oxygen (oxidant) and methanol (fuel) ; liquid oxygen (oxidant) and kerosene (fuel).

Nitric Acid

A good deal is already known about the toxicity of nitric acid, but this substance is included since it serves as a good comparison with the toxicity of other substances mentioned above.

General Properties

Concentrated nitric acid (HNO_3) is a fuming liquid which is heavier than water. Its specific gravity is 1.51. The commercial acid is more or less brown in colour on account of dissolved nitrogen tetroxide, but the pure acid is colourless. For the purpose of this paper nitric acid is referred to as a concentrated nitric

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acid of 90 per cent. concentration or over. It is generally a highly fuming liquid and is a corrosive.

Toxic Effects and Hazards

Associated with this acid are three important dangers:

(*a*) Oxides of nitrogen poisoning.
(*b*) Acid burns.
(*c*) Corrosive action on ingestion.

(*a*) *Oxides of Nitrogen Poisoning.*—The gaseous oxides of nitrogen are as follows:

Nitrous oxide (N_2O)—known as laughing gas, the well-known anæsthetic.

Nitric oxide (NO)—a colourless gas, non-irritant. Combines with Hb to form methæmoglobin and has been found to produce paralysis and convulsions in animals.

Nitrogen dioxide (NO_2)—dark chocolate brown gas, an irritant dangerously toxic.

Nitrogen tetroxide (N_2O_4)—colourless, an irritant and dangerously toxic.

It matters little whether these oxides of nitrogen enter the air as nitric oxide, nitrogen dioxide or nitrogen tetroxide, since the nitric oxide in contact with the air and oxygen at once turns brown and changes to nitrogen dioxide, and thus the nitrogen dioxide/nitrogen tetroxide balance comes into play. It is, however, intended to emphasize particularly the effects of the nitrogen dioxide/nitrogen tetroxide gaseous mixture since separately or together they are highly toxic. These gases are always present as a mixture and the relative proportions of these gases vary considerably according to the circumstances—i.e. temperature and humidity. The colour of these gaseous oxides varies from colourless to chocolate brown, depending upon the composition of the mixture, though it is practically always yellow to light brown. The intensity of the colour is, however, no indication of the degree of toxicity. These gaseous oxides are formed when nitric acid comes into contact with certain heavy metals (copper, brass, zinc) or with any organic material (wood, sawdust, paper). These gases are among the most treacherous because of the insidious onset of severe and sometimes fatal pulmonary œdema.

The effects of exposure to and inhalation of this mixture may be conveniently divided into (1) acute and (2) chronic, depending to some extent on the concentration.

(1) *Acute.*—On exposure, above 50 p.p.m. moderately irritating to the eyes and upper respiratory tract. Higher concentrations—150 p.p.m.—not painfully irritant, but causes an acid taste in the mouth. On inhalation, very high concentrations give rise to the following signs and symptoms: Weakness; shivering; dyspnœa; tightness across the chest; tachycardia; abundant expectoration of frothy serum; cyanosis; abdominal pain; pulmonary œdema; convulsions; collapse and death within five to eight hours.

Acute cases have been recorded where no signs or symptoms or pulmonary œdema have occurred and the victims have recovered completely.

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Also there is a type of acute case which gives rise to asphyxiation, convulsions, respiratory arrest.

(2) *Chronic.*—Inhalation : The signs and symptoms are—chronic cough ; headache ; inflammation of the mouth, nose and eyes ; corrosion of the teeth ; loss of appetite ; constipation.

These cases occur after prolonged exposure to gaseous oxides of variable concentrations under very different temperature and humidity conditions. They depend also to some extent upon the susceptibility of the individual. Inhalation of this mixture throughout an eight-hour period of as little as 25 p.p.m. (American Standard Association) may cause pulmonary signs and symptoms referred to under the acute stage after five hours to as many as forty-eight hours. Delayed pulmonary œdema may follow exposure to high concentrations of 100-150 p.p.m. for only half an hour to an hour. While the American Standard Association have fixed this safe limit for an eight-hour daily exposure at 25 p.p.m., cases have been recorded which have developed toxic symptoms under this low limit. Recent experiments in America, where rats were repeatedly exposed to an average concentration of 25 p.p.m. of nitrogen dioxide, resulted in pulmonary œdema. On the basis of experiments at present in progress of exposure to 5 p.p.m., it is suggested that the safe limit be reduced to 5 p.p.m. of gaseous oxide.

Since the gaseous oxides may cause little or no discomfort at the time of inhalation, the exposed worker may continue his work feeling quite well though severe lung damage has been caused, the signs and symptoms of which become distressingly obvious several hours later.

One further word about the causation of pulmonary œdema. While it is believed that a high concentration of the gaseous oxide of nitrogen acts by irritation, it is by no means certain that this is so at low concentrations and the following explanation has been suggested. Nitrogen dioxide hydrolyses slowly in water or humid air to form nitrous acids. The theory is that during inhalation the relatively dry gas/air mixture reacts little with the slightly moist surfaces of the respiratory passages, whereas after reaching the alveoli and the interstitial tissues of the lung, the humid air and moist surfaces promote almost complete hydrolysis with the alveolar tissues. When patients survive pulmonary œdema, pneumonia is often a sequela, which sometimes proves fatal in later weeks.

In connection with the cyanosis, while methæmoglobin may be found in the blood, it is probable that the exudate œdema is the main factor in preventing oxygen penetrating to the pulmonary capillaries, and the cyanosis results from anoxæmia which is neither cardiac nor intrinsically pneumonic. The pre-cyanotic stage reveals flushing, drooping eyelids but no blueness. Within a short time, the patient changes colour and develops heliotropic cyanosis. The patient is not generally in physical distress, but the prognosis is almost hopeless. In the terminal stage the lips and ears arrest notice by their deep purple hue, the face is less heliotropic and the patient may live for another twelve to twenty-four hours.

(*b*) *Acid Burns.*—Nitric acid burns, in common with other burns, are associated with varying degrees of shock, but they are not associated with toxic absorption. They generally occur on the hands and face and tend not to char the

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tissues. They are intensely painful. Splashes of nitric acid may involve the eyes, giving rise to excruciating pain followed by corneal ulceration with consequent impaired or permanent loss of sight.

(*c*) *Corrosive Action on Ingestion.*—Nitric acid is similar to sulphuric acid when ingested and the symptoms are immediate with severe burning of the mouth, throat and stomach, spreading over the whole abdomen. The acid has no tendency to char the tissues and therefore perforation occurs less frequently than with sulphuric acid. Gaseous irritations which are very distressing to the patient often occur associated with vomiting, the vomit being dark brown or black in colour mixed with altered blood. The respiration is difficult and noisy. The voice is hoarse and speech may be impossible. Acute œdema of the larynx may occur and cause rapid death from asphyxia. Death usually occurs within twelve to twenty-four hours from the local action, or partial recovery takes place and death occurs after a few days with gastric inflammation. The patient may recover from the acute symptoms and die after two or three weeks from weakness and exhaustion, or he may live for years with stricture of the œsophagus or other sequelæ. Should stricture not occur, the destruction of the gastric mucosa cause a loss of digestive juices and the patient emaciates from chronic malnutrition. In addition, there may be symptoms due to inhalation of gaseous oxides with the subsequent onset of pulmonary œdema.

Concentrated Hydrogen Peroxide—H_2O_2

General Properties

It is generally referred to as H.T.P. which means High Test Peroxide, and it is a concentrated solution of hydrogen peroxide in water of 80 per cent. or higher concentration of high purity. It is a colourless or nearly colourless liquid of density of about 1.35. H.T.P. is not itself inflammable, but due to its powerful oxidizing properties it can give rise to fires in contact with combustible materials. In contact with many materials—iron and certain other metals—H.T.P. decomposes, evolving heat and forming steam and oxygen. It is most important that H.T.P. should be kept free of dust and dirt generally and only come in contact with inert materials, such as glass, earthenware, stainless steel, certain plastic materials and natural rubber, not as a container, only as protection for personnel. H.T.P. is rendered relatively harmless when diluted with four parts of water.

Toxic Effects and Hazards

H.T.P. itself is not poisonous but is damaging to the tissues. The vapours given off by H.T.P. or in contact with the ground, etc., are not toxic and, although they do irritate the eyes and the nose, they are practically harmless. Splashes in the eye are very painful. The mild irritant effect on the eyes tends to cause lachrymation associated with conjunctivitis and a mild coryza associated with an injected mucosa. When completely decomposed H.T.P. gives free oxygen and is thus not toxic for use in an enclosed space. Exposure to a heavy mist of H.T.P. droplets has an irritant effect on the lungs, and for this reason asthmatics,

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chronic bronchitics, bronchiectasis and other chronic lung conditions should not be exposed to it.

Recent experiments in America using animals (rats) have been carried out with 90 per cent. hydrogen peroxide, the results of which are preliminary and subject to revision.

Inhalation.—On exposure of rats to a concentration of 2,800 p.p.m. at 75°–80° F. the animals were observed for fourteen days. No symptoms other than excitement at the beginning of exposures were noted—the animals remained calm and appeared normal. Intravenous injection of this substance into rabbits—the rabbits died from gas embolism. Skin absorption tests on rabbits with this substance resulted in absorption of hydrogen peroxide, causing death by gas embolism. There was apparently a marked species variation by this method; cats, pigs, guinea-pigs, rats and dogs revealing far less general systemic toxicity and a far greater local skin reaction. Rabbits are known to be susceptible to air embolism. Skin absorption tests, subcutaneous and intravenous injections of this substance have led to the conclusion that the greater the local reaction the lower the toxicity. Similarly, intravenous injection led to the conclusion that the toxicity was increased with the dilution.

Applied to the skin of rats, there was local swelling and blanching with subsequent sloughing and ultimate partial regeneration or scarring. Applied to the corneæ of rabbits, minor effects were caused which disappeared without residual injury. On the other hand, permanent opacities occurred.

Conclusions.—Hydrogen peroxide inhalation involves no major respiratory hazards. Skin hazards may be severe and liquid splashes should be avoided. Liquid splashes in the eyes must also be avoided. Severe corneal damage giving rise to impaired visual acuity or permanent blindness may be caused by relatively small amounts of the liquid.

Liquid Oxygen—O_2

General Properties

Liquid oxygen boils at −183° C. and its density is 1.14 at this temperature. It is non-inflammable.

Toxic Effects and Hazards

Inhalation of 100 per cent. oxygen at atmospheric pressure for long periods has caused no observed injury to man. At higher pressures (three atmospheres) for three hours produces no distressing symptoms. Convulsions have occurred in man after oxygen has been breathed for forty-five minutes at four atmospheres pressure, while after one to three hours at one atmosphere pressure, concentration and co-ordination become impaired or increased effort was necessary to maintain them. Healthy young men can breathe oxygen at three atmospheres pressure for three hours without ill effect, but during the fourth hour the pupils dilate and the visual fields become distracted and some impairment of central vision—all of which are criteria of oxygen toxicity. Circulatory changes include a peripheral vascular constriction associated with visual impairment and an abrupt

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rise in systolic and diastolic blood-pressure, techycardia and extreme pallor. At this stage the patient experiences dizziness and a feeling of impending collapse. Rapid and complete recovery associated with a feeling of alertness and stimulation results within an hour when air is substituted for oxygen.

In animals (dogs) it has been found that there was a fall in oxygen saturation of the blood, a rise in hæmoglobin associated with lung congestion, œdema, right heart failure and congestion of the liver. Gaseous oxygen may be harmful to persons with pulmonary tuberculosis, chronic bronchitis, asthma and bronchiectasis.

Liquid oxygen is not toxic, but owing to its low temperature the liquid can cause serious burns if in prolonged contact with the skin.

Moreover, fingers and hands when directly exposed to it may develop "frostbite" and gangrene. But small degrees of skin contamination are not dangerous owing to evaporation.

Liquid oxygen may cause severe burns of the cornea associated with scarring and impaired or total loss of sight.

Hydrazine and Hydrazine Hydrate

General Properties

Hydrazine (N_2H_4) is a colourless liquid or a white solid.

Hydrazine hydrate ($NH_2NH_2H_2O$) is a colourless or pale yellow alkaline liquid with faint ammoniacal odour. Since hydrazine in contact with air or water forms hydrazine hydrate, the toxic risks are the same for both, excepting that the symptoms are considerably reduced and the survival time longer in the case of hydrazine hydrate. Both liquid forms fume visibly in air. It is, therefore, proposed to deal with these substances as one.

Toxic Effects and Hazards

Hydrazine.—This is chemically allied to ammonia, which it is well known has a very pungent smell and irritates the upper respiratory tract and the eyes. The presence of ammonia in the air can easily be detected owing to the strength of smell at concentrations too low to be dangerous. If, however, an individual is exposed to high concentrations of ammonia vapour they may be overcome. Signs and symptoms include—restlessness, vertigo, gastric pain, nausea, vomiting. Contact of ammonia with the cornea of the eye may lead to permanent or serious damage.

Various reports have been received from medical authorities in Germany about workers exposed to the fume of hydrazine during the recent war. The signs and symptoms include—headache, gastritis, diarrhœa, restlessness, nausea, vomiting, loss of power of concentration, respiratory embarrassment, depression, bradycardia, coma and death.

Skin Irritation.—At Pennemunde it is reported a small proportion of workers were highly susceptible and developed a contact dermatitis. These workers had been handling mixtures of hydrazine hydrate, ethyl alcohol and traces of potassium cupro-cyanide. There was a tendency for cuts to become septic.

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Some workers at Farnborough handling C-stuff experienced dermatitis of the hands and forearms which was associated with severe itching. Calamine lotion cleared it up and previous application of vaseline and of lanolin gave some protection. One man whose face was sprayed with hydrazine hydrate developed blisters in spite of washing. These cleared up with vaseline within two days. Recent skin tests with this substance revealed no marked skin irritation.

Inhalation.—In America experiments on rats reveal that inhalation of saturated hydrazine vapour for half an hour resulted in fatalities in about 17 per cent. of the animals exposed. Restlessness was clearly evident at the beginning, followed by epistaxis, and there was pronounced salivation. Neurological disturbances occurred, terminating with convulsions. Death was delayed about two days after exposure.

Skin absorption.—Tests have also been carried out with undiluted hydrazine on the skin of rabbits. A prompt local reaction occurred with a delayed systemic effect. The local effect consisted of a purplish discoloration which appeared in two to five minutes, rising to a maximum and gradually disappearing in forty-eight hours. It was thought that the discoloration was due to subcutaneous hæmorrhage, which sometimes resulted in sloughing of the skin and subsequent scar formation. The systemic effect consisted of the development of extensor rigidity followed shortly by intermittent clonic convulsions. There was also congestion of the lungs, congestion of the kidneys and tubular casts. Applied to the cornea of the rabbit's eye, hæmorrhages occurred.

Conclusions.—Inhalation of hydrazine is moderately severe so that respiratory protection is indicated. Hydrazine skin toxicity is of a high order of magnitude. Splashes on the skin should be removed as soon as possible by washing freely with water. Eye protection is necessary for both compounds. Investigations of subacute and chronic effects of this substance are still in progress.

METHANOL—METHYL ALCOHOL—CH_3OH

(Other names—wood alcohol, wood spirit, carbinol, columbrian spirit)

General Properties.

A colourless volatile liquid, miscible with water, boiling well below the temperature of water and having a specific gravity of about 0.79.

Toxic Effects and Hazards

As a vapour by inhalation methanol is toxic. Signs and symptoms are the result of injury to central nervous system with particular emphasis on optic atrophy. It also causes degenerative damage to kidneys, liver, heart and other organs. Symptoms are generally delayed from nine to thirty-six hours, during which time all individuals may continue to carry on. Suddenly weakness, headache, nausea, vomiting, abdominal pain, dimness of vision and even unconsciousness may develop. Less concentrated amounts give rise to symptoms of local irritation of eyes, headache, fatigue, drowsiness and sweating. Blindness affects both eyes and may set in within a few hours or it may be delayed several days.

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Toxic absorption may be slow and it is accumulative and slowly secreted. The accepted maximum allowable concentration of vapour is 200 p.p.m. for an eight-hour work day.

Ingestion.—Symptoms are quite prompt after swallowing : redness and blueness of the face and mucous membranes associated with depression, weakness, headache, nausea, abdominal pain, shortness of breath, delirium and cold sweats. Many cases develop blindness, temporary or permanent, due to optic atrophy.

Skin absorption.—Absorbed through the skin, this substance gives rise to the general symptoms already referred to. In addition, after repeated or prolonged contact, dermatitis occurs. The skin becomes rough, red and dry and cracks easily and is very susceptible to infection.

Kerosene

General Properties

Many varieties have been considered as gas turbine fuels for aircraft use. The current fuel boils between 160° C. and 275° C. and a saturated vapour is too weak to ignite at normal temperatures. Kerosene consists of a mixture of hydrocarbons.

Toxic Effects and Hazards

On account of the low volatility and composition, kerosene does not give rise to toxic effects at normal temperatures. Toxic risks may arise, however, from additions such as lead tetraethyl.

Toxic gases, especially carbon monoxide, are given off after combustion. The general symptoms of poisoning of this gas are well known—lassitude, headache, giddiness, faintness, nausea, muscular weakness. Pulse respirations are increased and concentration becomes impaired. Later there is mental confusion, diminution of sight and hearing, palpitations and dyspnœa with ultimate complete paralysis, coma and finally painless death. Death is due to deprivation of oxygen and there is no specific toxicity in the gas, although this is not necessarily true of coal gas and similar mixtures of gases. The patient may show reddish patches on the skin and occasionally blisters may occur. Albumin and sugar may be found in the urine. Sequelæ—amnesia and nervous disorders.

First Aid

It is not intended in a paper of this kind to discuss the comprehensive treatment of the toxic effects of these substances, but a few words about first aid will be helpful.

In cases of ingestion of acid, emetics should not be given nor should a stomach tube be used. The first thing to do is to attempt to neutralize the acid with copious draughts of water or milk, adding two teaspoonfuls of magnesia, chalk or whitewash. Carbonate or bicarbonates, such as washing or baking soda, should not be administered if other substances can be obtained, by virtue of the liberation of carbonate dioxide, which may cause gastric perforation from the dilation of the stomach or may precipitate heart failure.

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Workers who inhale the oxides of nitrogen must be kept under observation for at least twenty-four hours, because of the delayed effect of nitrogen dioxide. The individual who has inhaled the mixture should not be allowed to undertake any exertion, but should be made to rest for twenty-four hours.

In the more serious cases the patient should be removed at once into a clear atmosphere and kept warm and the doctor sent for immediately. Quiet and rest is essential. Hot tea or coffee may be given but not alcohol. If there is difficulty in breathing and coughing continues, pure oxygen is given. Only if respiration has ceased should artificial respiration be conducted. Morphia should ***not*** be given since it depresses the respiratory centre.

The most important treatment of burns is to wash the acid off as quickly as possible—within seconds—with copious supplies of water. For this purpose baths must be provided for containing clean water, preferably heated, at convenient places so that the whole body if necessary can be totally immersed without delay. Acid-soaked clothes should be stripped off. Splashes in the eyes should be treated immediately by irrigation with water, followed by irrigation in 2 per cent. solution of sodium bicarbonate, an eye-pad applied and the doctor sent for at once. Time is an essential factor in these cases. Shock from acid burns is treated in the accepted way.

For burns by concentrated hydrogen peroxide, dab away (not wipe) as much of the peroxide as possible. Remove or cut away contaminated clothing and thoroughly flood the affected part with water. Then apply a sterile dressing and treat as an ordinary burn. Splashes in the eyes should be treated as above.

In the event of air embolism the patient should be kept quiet and warm. Stimulants may be administered hypodermically and amylnitrite inhaled. Death may be due to arrest of pulmonary circulation or to cerebral anæmia.

Burns caused by liquid oxygen should be treated in the same way as corrosives and treatment for the eyes is identical. Cases should be referred to a doctor as soon as possible. In cases of "frostbite" the affected part should be protected from cold and very gradually warmed by slow thawing. The temperature must not be brought above that of a cold room—the part being left outside the bedclothes and simply wrapped in cotton wool. Do not give massage—this causes damage. Treat for shock and give warm drinks. Cases of gangrene should be seen at once by the doctor.

In cases of skin contamination by hydrazine and hydrazine hydrate, thoroughly flood the affected skin with water as soon as possible and apply calamine lotion. Splashes in the eyes should be treated as above.

In cases of inhalation of methanol vapour, remove patients into the fresh air, keep quiet and warm with blankets and hot water, give oxygen, and if breathing fails apply artificial respiration until patient breathes again or until a doctor instructs otherwise. In cases of ingestion, an emetic of salt in water may be given. Splashes in the eyes should be treated by irrigation immediately and continued for at least thirty minutes. Irrigation may be followed by the installation of liquid paraffin or castor oil. The patient should then be referred to a doctor or hospital for further treatment.

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The chief toxic hazard associated with kerosene is carbon monoxide. Remove the person from the cause and keep the patient warm. Clothes should be loosened at the neck and waist and artificial respiration applied. Give oxygen inhalations and treat for shock.

Prevention

From what has been said about the toxic effects of rocket propellants, it will be fully appreciated that under no circumstances should the oxidant and fuel be in close proximity. It will be understood that there are always potential risks of fire, explosion, spills, crashes, enemy action, and adequate provision must be made for them. This is more the responsibility of the Safety Officer.

Protective clothing is an essential part of the organization and is recommended as follows:

Nitric Acid

White lasting cloth (flax material)—jacket and trousers.
Lasting cloth cap with back flap.
Eye-shields, rubber gloves, rubber boots.
Masks should be worn. Those suitable for oxides of nitrogen have a short life of twenty to thirty minutes and therefore need changing on the spot.

Hydrogen Peroxide

Polyvinyl chloride (plastic) jacket and trousers or long polyvinyl chloride smock and hood.
Eye-shields, rubber gloves, rubber boots.

C-Fuel

Clothing should be worn with all fastenings properly closed.
Eye-shields, rubber gloves, rubber boots.

Some maximum allowable concentrations in air

Nitrous fumes	5 p.p.m.
Ammonia	100 p.p.m.
Methanol	200 p.p.m.
Carbon monoxide	100 p.p.m.

Finally, if the contents of this paper in connection with rocket propellants has brought home to you as fellow doctors the significance of the trend of the future, it will be reassuring to know that we are preparing to meet our ever-increasing responsibilities and problems. In this connection it is felt that there is a need for Service Medical Officers to do short spells of duty at our Research Establishments.

Acknowledgment is made to the Ministry of Supply for permission to publish this paper.

"Enthusiasm is the element of success in everything. It is the light that leads and the strength that lifts men on and up in the great struggle of scientific pursuits and of professional labour. It robs endurance of difficulty and makes a pleasure of duty."—The Right Reverend W. Croswell Doane (1832-1913), Bishop of Albany, New York, U.S.A.

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RECRUITING OF OFFICERS

BY

Major D. L. SCOTT, M.R.C.S., L.R.C.P.

Royal Army Medical Corps

WHEN I read the September issue of the Corps Journal I was both interested and appalled to see the D.G.'s statement at the Annual Consultants' Dinner that in two years' time the Corps would be 600 officers short. I notice, too, that only 31 officers are under 35, and I think the two are not unconnected.

A few thoughts have occurred to me about the shortage of officers and about what might be done about it in purely propagandist ways rather than by resorting to age-old method of trying to bludgeon an already over-burdened Treasury into raising officers' pay again—although, of course, there is no denying that any rises in pay are inevitably a very strong form of attraction.

I am quite certain that the idea of converting National Service officers to either Short Service or Regular officers is misconceived ; and I venture to suggest that to send to each officer who is about to transfer from whole-time to part-time service a pamphlet on "Conditions of Service in the Royal Army Medical Corps" is a gesture which is out of place. I feel this is so because by the time an officer receives this pamphlet his service is nearly over and he has been thinking for some time of returning to civil life. He has almost certainly arranged either with his old University or Medical School some appointment to take up, or he has been promised an assistantship in a local practice in his home town. In any event, in all but the smallest possible minority of cases he has made up his mind to go into civil life, and has something waiting for him in the way of employment.

Another factor which I believe may influence the National Service officer is the regrettable fact that only 31 officers in the Corps are under 35. It is fairly safe to assume therefore that in the large majority of R.A.M.C. messes the Regular officers are married and live out or else are at least ten and probably fifteen years older than the National Service officers. There is a tendency seen in many messes for the two not to mingle too freely. Because of this there is lost that inspiration which a really good and happy mess can bring to all its members. There is no doubt that a well-balanced mess with a gradual grading of ages from the most junior to the most senior means that everyone can get the best out of it, and mess life, be it good or bad, can be a very big influence in determining a young officer whether he should stay in or go out. Even if he sees advantages in the life in general and clinical opportunities, he may be influenced when he comes to weigh the pros and cons of "signing on" by a mess in which the middle element is missing and there is nothing between him and the C.O.

I maintain that a number of new officers probably go to the Depot prepared

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to enjoy their National Service and make the best of it. Many of them want to go abroad and see other countries and possibly learn a little about tropical medicine. But many of them, once abroad, because of circumstances either in messes or units, decide quite irrevocably against staying in. In many Commands the National Service officer is given a lot of odd jobs—in many cases out of hospitals, where he misses the amount of clinical work to which he is used and he feels that he is being treated as the *dog's body*. This is in fact partly true because all the Regular officers are so much more senior that they have to be employed in the more responsible posts, and he gets very much of the less pleasant work to do.

For these reasons, therefore, I think we make our appeal for Regular officers at the wrong time. We leave it too late and our concentrated effort should go into persuading the aspiring medical genius either before he qualifies or at any rate certainly before he is called up for National Service. And for this purpose I consider there are several methods of attack. But by far the most important is to attack not the student direct but the student through his teachers. In other words, the main weapon of propaganda must be that distinguished gathering whom the D.G. was addressing when he revealed these awful shortages.

Major-General Sir Heneage Ogilvie said at that dinner that many consultants looked back on their time in the Army as the happiest period of their lives. But let them remember that they came into the Army as consultants and they therefore regard the Army rather differently to many people because they were "made" men when they entered. It is therefore to those consultants who have happy memories of their service that we must appeal whilst their memories are still reasonably fresh. These are the men to whom we should send the most comprehensive brochures dealing with what the Corps can do for the medical man who chooses it as a career. These are the men who must be relied upon in some measure to put over to the student that if he joins the Army as a career he will get opportunities to take higher degrees ; that he will get a year's study leave for the purpose ; that having obtained his higher degrees, there is an enormous field for him in which to practise his art.

That is what the consultant can do for us, and those who have not served in the Army can do as much as those who have, if they know what in fact is offered.

And this is the plan for imparting the necessary knowledge. Besides pamphleteering, which is of a limited value, annual or bi-annual conversaziones could be held at the Headquarters Mess and College. To this would be invited one or two members of the teaching staff of all or as many as possible of the teaching hospitals and universities, and the function would be held somewhat in the manner of an Army Day and somewhat in the manner of an Army Exercise-cum-social function, with the main intention being to show off the R.A.M.C. at home in its headquarters, and to demonstrate what it can provide in the way of a career, professionally, socially and militarily.

Secondly, our direct attack on the student must be considered, and for him I consider that an inspired lecturer, if possible from among the under-35 group so that there is not the feeling of age discrepancy between lecturer and lectured, might arm himself with every known fact about the Corps and do a lecture tour

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of Medical Schools to point out what in fact the Army can offer to the qualified medical man. It must be brought to his notice that the Corps provides openings in all branches of Medicine and revealed to him as a career which is a suitable alternative to civil practice, instead of a necessary stage through which he must pass.

It is appreciated that all this is in the nature of a long-term policy, but the main point I would make in conclusion is that recruiting for Regular officers of our Corps must start with the medical student and not the qualified man, and our efforts should be directed to him with as little delay as possible.

REQUIREMENTS OF A MILITARY HOSPITAL

BY

Major S. MACKENZIE, O.B.E., M.R.C.S., L.R.C.P., D.C.H.
Royal Army Medical Corps

[*Continued from page* 119, *February issue*]

PART III—OUT-PATIENTS DEPARTMENTS

General

The requirement for the out-patients department is that it should have separate entrance and exit, and also have good access to the diagnostic and therapeutic departments, which of course also serve the wards. The entrance has been dealt with above in Part I.

One important object of having a separate department for out-patients is to segregate them from the in-patients and to avoid the necessity for them to have to enter and wander about inside the hospital, and especially the wards, more than is absolutely essential.

It is essential therefore that the out-patients department is adjacent to the X-ray department and to the physiotherapy and pathological departments, and to the dispensary, and has ready access to them. It must have an adequate waiting hall and cafeteria and some means of general supervision. Toilets should be provided, for some patients may have long periods to wait.

Consulting Suites

(*a*) Consulting rooms, dressing cubicles and examination rooms are best designed as self-contained suites. They may have to be provided for the following specialists :

General medical.	General surgical.
Skin.	E.N.T.
V.D.	Eye.
Psychiatric.	Orthopædic.
Dental.	Obstetric and gynæcological.

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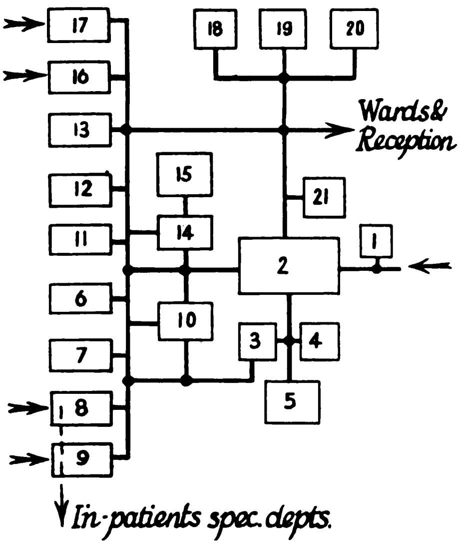
(*b*) There is no reason why one or two suites per division should not suffice for all the specialists in that division provided the consulting hours and days are properly organized and provided that the consulting rooms are equipped with the necessary apparatus and fittings to suit all the likely users in that division. The only specialists who need special accommodation peculiar to their art are the obstetric and gynæcological, V.D., dental, E.N.T. and ophthalmic specialists.

A common treatment room, somewhat like a unit medical centre, for out-patients coming up for treatment of minor conditions, inoculations, medical



1. Pram Shelter.
2. Waiting Hall.
3. Office.
4. Toilets.
5. Cafeteria.
6. Medical Consulting Suite.
7. Skin Consulting Suite.
8. Psychiatric Consulting Suite.
9. V.D. Department.
10. Medical and Skin Treatment Room.
11. Surgical Consulting Suite.
12. E.N.T. Consulting Suite.
13. Eye Consulting Suite.
14. Surgical Dressing Room.
15. Minor Operations Suite.
16. Obstetric and Gynæcology Suite.
17. Dental Department.

Main Building:

18. X-Ray Department.
19. Physiotherapy Department.
20. Laboratories.
21. Dispensary.

FIG. 12

GENERAL CIRCULATION OF THE OUT-PATIENTS DEPARTMENT.

Note the close linking to the X-Ray, Dispensary, Physiotherapy and Pathological Departments of the main Hospital Building.

inspections, etc., meets the requirements for such cases. A second one exclusively for skin cases may be necessary in some stations.

The detailed accommodation to be provided on this basis is therefore:

(*a*) Out-patients' supervisor's office.
(*b*) Waiting hall with small rooms off, for waiting officers and women patients, a cafeteria and toilet facilities.
(*c*) "Surgical" suite.
(*d*) "Medical" suite.
(*e*) Treatment room(s).
(*f*) Obstetric and gynæcological suite.
(*g*) E.N.T. suite.
(*h*) Eye suite.
(*j*) V.D. suite.
(*k*) Dental suite.

A minor operating theatre and plaster room should be provided in addition

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if the general theatres suite is not readily accessible. It avoids out-patients being brought right into the hospital. It should be close to the surgical consulting suite and should comprise :

(*a*) Operating room.
(*b*) Sterilization sluice and wash-up annexes.
(*c*) Plaster room.
(*d*) Anæsthetic room.
(*e*) Recovery room.

In a small hospital it may well be sufficient to provide only a combined operating and plaster room plus a sterilizing and sluice room.

A circulation diagram is at Fig. 12.

General Medical or Surgical Suite

It will be seen from studying the foregoing paragraphs that the requirement here is for two or more suites each comprising a consulting room, examination room and dressing cubicles. These can conveniently be grouped round the treatment room and minor operating suite.

E.N.T. Suite

Special requirements here are to meet the special investigations that have to be carried out by the otologist. It is essential to have a room for the accommodation of patients awaiting treatment or consultation who have been anæsthetized and where patients can also wait while recovering from minor procedures—e.g., antrostomy, cauterizing, etc. A dark room is useful but not as strictly essential as an audiometry room. The dark room can be combined with the audiometry room provided it is properly constructed of light-proof and sound-proof material. It is essential that the consulting rooms can be darkened at will if a dark room is not provided. Shading by venetian blinds is a convenient method of achieving this. It is also essential that an office be provided for the special records of the department and for the use of the specialist for his office work, which is quite considerable.

A circulation diagram is at Fig. 13 (*a*).

Ophthalmic Suite

Here it is essential to provide a dark room and there is also a requirement within the suite for at least one of the rooms to have a length of not less than 21 ft.—22 ft. for refraction cases. This length can be achieved by the use of two rooms intercommunicating, as a compromise, if it is inconvenient or impossible to provide an examination room with a length of more than 22 ft., but it is essential that this intercommunication be in one straight line. This provision of the eye-test type interval of 6 metres can sometimes be met in temperate climates by placing a mirror 10 ft. from the patient and suspending the object to be used

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over the patient's head, but is not recommended in tropical climates, where mirrors quickly become unserviceable; it is essential that the mirror remains perfectly reliable.

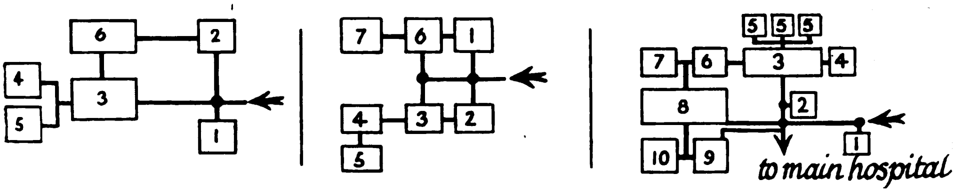
A circulation diagram is at Fig. 13 (*b*).

V.D. Suite

V.D. out-patients are most conveniently seen in the department which is to comprise also V.D. in-patients wards. This has therefore already been dealt with under the V.D. in-patients department (*q.v.*).

Obstetric and Gynæcological Suite

This should be provided with a separate entrance or with the waiting room right by the out-patients' entrance. It is convenient for it to be adjacent to the



(*a*) E.N.T.

1. Waiting.
2. Office.
3. Consulting and Treatment.
4. Dark Room.
5. Andiometry.
6. Anæsthetic and Recovery.

(*b*) Eye.

1. Waiting.
2. Office.
3. Treatment.
4. Consulting.
5. Dark.
6. Optician, Office and Records.
7. Optical Workshop.

(*c*) Gynæcology and Obstetrics.

1. Pram Shelter.
2. Office.
3. Waiting.
4. Toilets.
5. Changing.
6. Antenatal Consulting.
7. Antenatal Exam.
8. Treatment.
9. Gynæcological Consulting.
10. Gynæcological Exam.

Fig. 13
Special O.P. Departments.

reception arrangements for the families and female service wards. Requirement is for:

(*a*) Waiting room.
(*b*) Consulting room.
(*c*) Examination room.
(*d*) Treatment room.
(*e*) Record office.
(*f*) Changing cubicles.
(*g*) Toilet facilities for staff and patients.

The examination room should have available space which can be screened off by curtaining, as required, for a lithotomy chair for the examination of patients and for minor procedures to be carried out. There should also be provided a recovery bay to the treatment room. Storage accommodation for the department is essential.

A circulation diagram is at Fig. 13 (*c*).

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Dental Operating Suite

The accommodation needed is operating and laboratory accommodation for the specialist dental surgeon, comprising :

(*a*) Surgery.
(*b*) Mechanics' laboratory.
(*c*) Offices and store.
(*d*) Waiting room(s).

It is essential that the surgery and the laboratory face north or east. A suitable point must be installed in the surgery for plugging in a portable dental X-ray apparatus. No balcony or veranda must obstruct the windows.

Others

No special accommodation is required for consultation purposes by the orthopædic surgeon provided the surgical suite is close to the plaster room. The skin specialist and the psychiatrist need no more than is provided for the medical specialist and can use the same suite.

PART IV—PATIENTS' DEVOTIONAL, FEEDING, RECREATIONAL AND EDUCATIONAL ACCOMMODATION

A military hospital differs from a civil hospital in that a much higher proportion of its patients are up and about and suffering from relatively trivial complaints. It is essential, therefore, to provide adequate centralized feeding, devotional and recreational accommodation. Provision has to be made also for diversional handicrafts, and there is a requirement under existing Army policy to provide facilities for education.

Scaling

In a 500-bed hospital only a maximum of about 300 beds are ever likely to be filled by the class of patient using these facilities (that is to say, officers, female patients, isolation and T.B. patients will normally not be included). Of these 300 probably not more than about 50 per cent. will be up-patients and therefore 150 is a reasonable *maximum* of likely users of "public rooms." This basis can be used as a means of scaling the requirements of accommodation for education, recreation, diversional handicrafts, etc.

Feeding

(*a*) The up-patients' dining hall, served by the hospital kitchen, should be capable of accommodating up-patients to a figure of about 30 per cent. of the number of equipped beds of the whole hospital (for 500 beds, approx. 150).

(*b*) The ancillaries to the hospital up-patients' dining room are :

(i) Hospital kitchen.
(ii) Serving space.
(iii) Trolley bay.
(iv) Wash-up.
(v) Sink area.

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(*c*) The kitchen details are not entirely a matter for the medical services and the details of design should always be referred to the A.C.C., and any recommendations made jointly with them.

(*d*) The steward's accommodation is dealt with under the quartermaster's department (*q.v.*).

Devotional

It is considered essential that a small chapel be provided, available to all denominations, for private devotion. A large chapel is not considered essential since the dining room or one of the recreation rooms can be converted for this purpose as and when required. Church rooms for religious instruction are authorized in the Barrack Synopsis, Part I, at 250 square feet (f.s.) for a strength of troops from 500 to 1,000, and this size should be adequate for the type of chapel envisaged here. There is also a necessity for an office and vestry for the chaplain.

Recreational

A games room of about 600 f.s. and a separate room for reading, writing letters, looking at newspapers, etc., is an essential provision. Another sitting room, with wireless loud-speaker or television, etc., is an extra refinement.

Diversional Handicrafts

This department is normally supervised by the Welfare Officers of the Services Hospital Welfare Department of the Order of St. John and British Red Cross Society, and their requirement for this is one therapy room to cover all crafts other than carpentry. Carpentry is better provided for by the education section, where synopsis scales permit the provision of a crafts and hobbies room ; any diversional therapy involving carpentry is best undertaken in that department. The Welfare Officer supervises the patients' library and reading room and this should, therefore, be adjacent to the therapy room. She will also require an office and a store.

N.A.A.F.I. Accommodation

The N.A.A.F.I. accommodation provided for a military hospital should consist of :

(*a*) N.A.A.F.I. canteen.

(*b*) Accommodation for the kitchen and staff.

(*c*) Games room, where not provided as part of the recreation accommodation.

Patients' Education

One or two classrooms, according to size of the hospital, and a library and information room, plus hobbies room (if required), should meet all the needs of this department. An office and store must be provided for the education staff. The unnecessary duplication of educational accommodation for patients and staff should be avoided wherever possible, and a system of staggering the use of one set of accommodation should be developed in a small hospital.

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PART V—HOSPITAL ADMINISTRATIVE DEPARTMENTS

OFFICES

(*a*) The scale of offices set out below is that suitable for a 500-bed hospital:

C.O.	Post.
Administrative Officer.	Pay.
Chief Clerk.	Spare office and records store.
Hospital Clerks.	Matron.
Chief Wardmaster.	Deputy Matron.
Company Officer.	Surgical and Medical Division Offices.
Company Sergeant-Major.	Medical Officers' Library.
Company Clerks.	Medical Board Room.

These rooms are all essential on the existing organization of military hospitals of that size, but the number and nature required for smaller ones would naturally be less.

(*b*) The requirement for Divisional Offices will only arise in the larger hospitals and should comprise an office-consulting room for Officer i/c Division, and a room for the divisional wardmaster and clerks; a waiting lobby outside is essential.

(*c*) The board room will be used by the Command Standing Medical Board as well as by the Hospital Boards which are required to be assembled from time to time on in-patients, and it is usually a very busy place when in the principal hospital in a Command.

(*d*) A Medical Officer's library is essential since it not only accommodates the hospital medical reference library, but provides a place where orders, A.C.Is., etc., are laid out for M.Os. to see. It is also the room for clinical meetings and discussions and for teaching purposes, and doctors' common room. The principal hospital in a Command is the centre of all clinical and professional teaching for the medical Officers in the Command, and this room is to be regarded as essential.

STAFF TRAINING FACILITIES

A hospital acting as the Command training centre for nursing orderly training requires accommodation to be planned for the sister tutor. This has to satisfy the standards of the General Nursing Council, and the minimum acceptable accommodation is for a lecture room, a model ward, sister tutor's office, store room and a private study room. The best location for this accommodation is in the men's lines, but should these be too far distant, any *quiet* area in the hospital itself will suffice.

QUARTERMASTER'S DEPARTMENT

There is a requirement for the following (which are dealt with in detail below):

Quartermaster's office.	Steward's store.
Q.M.S. office.	Steward's office.
Quartermaster's clerk's office.	Dispensary, pharmacy and medical store.

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Hospital pack store, including officer patients' kit store.
Hospital barrack equipment store.
Sanitation store.
Oil store.
Disinfector and incinerator.
Fire station.
Power station and generators.
Garage.
Workshops for electrician, plumber, carpenter.

Steward's Store and Office

This should be regarded as the dry goods store for the hospital, making issues to the kitchen and to the wards. It is also the transit and accounting centre for the perishable food, for whose receipt, issue and accounting the steward is responsible. It should, therefore, be arranged that the steward has his accommodation placed in such a position that he can readily supervise his own store and its issues to wards and kitchen, but also the delivery of food by contractors to the cold stores and perishable food stores, which may, for convenience, themselves be located in or adjacent to the kitchen. Cold stores, to synopsis scales, should be provided.

Dispensary, Pharmacy and Medical Stores

(*a*) The dispensing unit, from which issues of drugs, dressings and equipment are made to in-patients departments, to out-patients and to medical officers and M.I. Rooms of outside units, is a very busy department and adequate space for the dispensers to work in is essential. It should be very readily accessible to the out-patients department, if not actually adjacent to it. An issue and waiting room of about 250 f.s. is required, and leading off from it a dispensing workroom with the preparations, drugs, etc., in day-to-day use; about 250 f.s. is the minimum acceptable. It is often convenient for the waiting room to be divided by a partition into out-patient and in-patient sections.

(*b*) In support of this dispensing unit there requires to be a pharmacists' store for the three main groups of medical equipment, viz.:

Drugs and chemicals,
Bandages, dressings, wool, etc.,
Instruments and appliances,

with special provision in hot climates for proper storage of rubber and other goods which are highly perishable in tropical and humid conditions. There is also a requirement for 3–5 cu. ft. cold storage for sera and vaccines, penicillin preparations, etc. For all these purposes a total area of 500 f.s. is not too large.

(*c*) In addition there will be a requirement for a bulk medical store for baled equipment and storage of cylinders and also for a small store for inflammable liquids (ether, alcohol, etc.) and gases outside the building. The main hospital in a Command abroad almost invariably has to carry out some of the functions of a sub-depot of medical stores unless a sub-depot is provided separately. Unless such stores are properly planned and given adequate accommodation from the beginning, endless trouble is caused when they come to be taken into use. 1,000 f.s. is the minimum acceptable for a hospital of 500 beds.

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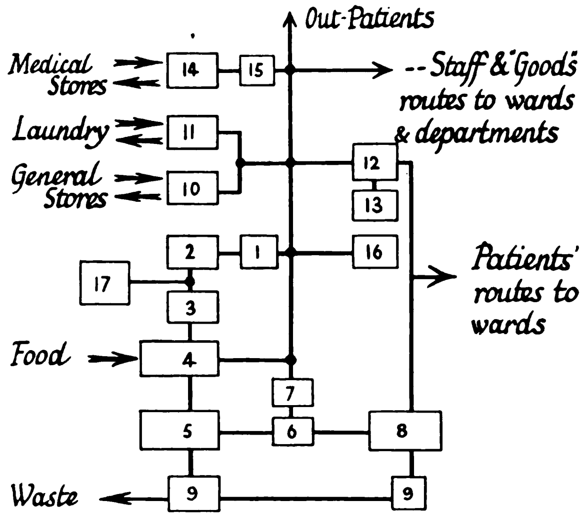
Pack, Linen and Barrack Equipment Stores

It is most important that all these stores be provided with adequate shelving. The linen store should have good access to the outside loading bay as well as to the inside lobby of the stores department, and space within the store should be provided for segregating and sorting dirty linen prior to its dispatch to the laundry. This can conveniently be done by the provision of suitable bays and bins for the different types of linen to be handled. The pack store should include a separate locked compartment for officers' kit, and the main store itself should have a hatch or doorway at which other-rank patients draw their own kit prior to discharge.



1. Q.M.
2. Q.M. Clerks and Q.M.S.
3. Steward.
4. Steward's Stores.
5. Kitchen.
6. Service.
7. Trolley Service.
8. Dining Hall.
9. Wash-up.
10. Barrack Store.
11. Linen Store.
12. Pack Store.
13. Officers' Kit Store.
14. Reserve Medical Store.
15. Dispensary and Detail Medical Store.
16. C.O. and Admin. Offices.
17. Sanitation, Oil Store, Garage, Fire Station, Generators, Workshops, Disinfectors, Incinerator (all outside).

Fig. 14
Q.M. Departments.

Sanitation Store, Oil Store, Disinfector and Incinerator

These need not be located within the hospital building itself, and in fact are better outside. If the incinerator is provided too far from the hospital, the staff are sometimes too lazy to take refuse there. If it is located too close its smoke and smell may become a nuisance. The oil store, if located outside the hospital, may require a small issue section in the barrack equipment store for the daily issues for wards and departments of paraffin, etc., for primus stoves or other uses.

Fire Station, Power Station, Generators and Garage

The location of these depends on the access to the site from the main road serving the area and is a matter for the Engineers. The garage should comprise lock-up accommodation for the hospital's own transport and shelter for the private cars of the hospital staff, in addition to ambulance shelters. The size of

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the power station and boiler-house will depend upon the type of heating to be provided. Generators are provided to maintain a stand-by source of power and light for the operating theatres and the X-ray department in the event of failure in the main electric supply.

Artisans' Workshops

Although electricians, plumbers, carpenters, etc., are not included in the staff of a hospital, a considerable amount of daily maintenance work by such artisans is always taking place, and it is essential for suitable workshops and small stores to be provided for them. Whole-time or semi-whole-time tradesmen or civilians are usually provided by the local C.R.E. in his own interests for the purpose of maintenance at the hospital. Suitable accommodation should be designed for them from the beginning.

A circulation diagram of the Q.M. department is given at Fig. 14.

SUMMARY

The requirements are stated that have to be met in planning a military hospital or any part of it. These requirements are set out, department by department, in the form of an *aide-mémoire*. With the exception of certain fundamental points, therefore, no discussion has been developed of the reasons for coming to any conclusions regarding the actual requirements stated.

Attention is also drawn to factors to be borne in mind when considering the relative merits of "horizontal" versus "vertical" construction and when considering the three basic ward types. Apart from one or two references to the need for air conditioning in certain departments, no attempt has been made to meet special climatic factors, and the requirements are those for the normal military hospital in a temperate or sub-tropical climate.

Consideration is not given to such matters as lighting, heating, ventilation, siting, communications or other such problems, which are to be the subject of a separate paper. Neither has any mention been made of the special factors affecting design of military as opposed to civil hospitals.

CONCLUSION

The suggestions made in this paper are the outcome of the study of others' opinions and experience and are by no means due to original thought on the part of the writer. They are an expression, or collation, of the opinions of numerous Army Consultants and Advisers, and of the reports of various committees and experts on the many aspects of the subject. The writer has had the opportunity, in the course of his routine work, of obtaining all these views and opinions and, where necessary, helping to resolve conflicting ones. The notes have been useful to him in interpreting to the administrative medical officers and to the

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architects, engineers and finance experts, who have actually been engaged in the design of projected new military hospitals or alterations to existing ones, the current trend of policy so far as the Army Medical Services are concerned.

He hopes that they may be useful to others also as an ***aide-mémoire*** for those who are interested in the subject and for those whose task it may suddenly be to have to take an active part in such planning. No such collation exists at present and there is no easy-reference manual on the subject. That is the writer's sole excuse in publishing these notes.

The writer is indebted to so many members of the Army Medical Services, as well as to a large number of friends and colleagues in the engineering and architectural professions, both civil and military, that it would be impossible to enumerate them all here, and so express properly his gratitude and appreciation for all their help and patience during the two-year period that has elapsed since the work was begun.

He would, however, like particularly to thank Miss Winter and her staff, and Miss Gearing—all of the War Office—for the immense amount of typing and checking of lists, summaries and schedules involved ; and of the cross-checking, correction and retyping made necessary as the work progressed. Without them it could never have been completed.

He would also like to thank Colonels J. C. Barneston, M. A. Rea and J. P. Douglas, under whose direction the work has been done and but for whose encouragement and stimulation these notes would never have been written, let alone published ; and to thank the Director-General of Army Medical Services for permission to publish the paper.

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MEDICAL COVER

BY

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Specialist in Army Health

[*Continued from page* 124, *February issue*]

Health Services

The object of the Health Services of the Army is the maintenance of a high standard of both mental and physical health among the military population. This is achieved by active measures both to prevent the spread of disease and to ensure that the environment and mode of living of the Army are brought up to a sufficiently high standard to enable the optimum health to be maintained.

When considering the purpose for which an Army is kept, it is obvious that such a service is of vital importance, and however excellent the curative side of the Army Medical Services may be, it is clearly in the direction of Health Maintenance that the greater part of the efforts of the Service must be directed. In this, also, they are assisted by the combatant arms.

The duty of maintaining a high standard of health among the troops has been laid upon their Commanding Officer. It is up to him to acquire a general knowledge of hygiene, and to take advantage of medical advice when necessary.

The maintenance of good health is equally important to a civil community, but tends to become overshadowed in civil medical practice by the much greater necessity for curative services, especially for those members of the community, the chronically unfit, the very young, the ageing, and the old, who are not found in the Army.

Owing to the nature of the countries in which the Army is often required to carry out its duties and the conditions under which it has to perform them, an accurate knowledge of the types of risk to which it is likely to be exposed is essential, in order that possible means of prevention may be investigated and, when known, enforced in a manner that can be understood and carried out by all. The numerous past campaigns in malarious areas have always taken their toll of men's lives before active measures for prevention have properly taken on. Once these extremely simple and effective measures have been fully understood by all, the Army has generally fought its way to a victory that might otherwise have been withheld.

Military history is filled with instances of battles, not so much against a human enemy as against dysentery, malaria, and typhoid. Although these diseases

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are now well understood and easily prevented in a modern army, they are always to be regarded as a potential enemy, lying in wait for their "fifth column," ignorance, dirt and carelessness, to give them the opportunity to attack.

The history of Public Health in Great Britain is a similar story, of battles against typhoid, dysentery, smallpox, cholera, and their allies, dirt, ignorance and poverty. The dangers of these diseases have now been overcome and, provided social conditions remain as they are, are unlikely to arise again. Only a catastrophic disaster such as a war, waged against the civil population by bombing, or actually fought on the soil of Britain itself, is likely to bring these diseases back again. However, it must be remembered that they are always in hiding somewhere about, and the occurrence of epidemics in big cities in civilized countries during the recent war should keep the mind of the civil health authorities constantly focused on the problem.

Preventive Medicine, therefore, plays a vitally important part in the Army Health Services, especially where overseas stations and battle conditions are concerned.

However, in order to get the greatest benefit out of these services, the material of which the Army is composed must be of the highest quality and entirely suited to the purpose for which it is required. The preparation of this material, by sorting out the right components, by attempting to improve what is in need of improvement, and by adding to it anything that is going to make its performance more efficient, largely falls to the lot of the Army Health Services.

Thus, to produce a useful army, first the required number of reasonably healthy men must be obtained. Absolute hundred per cent. fitness is of course desirable, but, when large numbers have to be found, is not possible, and therefore a certain number of those who are functionally useful, though not fulfilling all the requirements of the front-line soldier, must be included.

By an efficient method of medical categorization and personnel selection recruits can be sorted according to their functional and mental ability, and can be allotted to the particular arm of service and theatre of operations for which they are most suited. Within the unit, efforts are made to fit the right man into the right job, both from the physical and psychological aspect.

The process of training to which every army recruit is submitted aims at improving his general physique and adapting him to Army life. It also shows up the sub-standard man, for whom special provision should be made.

A very important part of every recruit's training is Health Education, whereby he learns the importance of personal hygiene and the means of protecting himself against disease, an essential thing for him to know now he has entered a life which may involve considerable risk of disease.

Protection against the diseases of environment is given by the adequate clothing and equipment of the soldier, and protection against certain specific diseases associated in the past with campaigns, such as typhoid, smallpox, tetanus and yellow fever, is given as required by inoculation or vaccination before leaving for a destination where these may be encountered.

Having, therefore, produced the material, its high standard must be main-

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tained. This is achieved by the constant supervision on the part of the Medical authorities of environmental conditions, which include living conditions, work, training and recreation, food and nutrition, climate, etc., and by carefully noting the effects of such conditions on the soldier's health. A regular check-up of the soldier's medical category is essential, and this as far as possible is carried out annually. Similarly, on discharge from hospital, the medical category is modified when necessary. Anyone falling short of the requirements for the particular role in which he is employed must be found alternative employment or discharged from the Army. Rehabilitation of ex-hospital cases is of very great value in maintaining high health standards by the restoration of the unfit.

Thus, the Army Health Services have the function of sorting out to the best advantage the material they have, improving it when possible, maintaining the standard high and getting rid of what is unsuitable.

The civilian health services, on the other hand, have to make provisions for what is already in existence. The population cannot be made perfect by selection of the best only. The civil population embraces all age groups, and all degrees of health. Rather than sort out the best and attempt to make them better, the civilian service has largely got to cater for those groups of the population who are in most urgent need of help. Civilian health services mainly concern themselves with the young, the old, the poor, and the chronically unfit, and Part III of the National Health Service Act, 1946, largely covers the requirements of these groups.

The common aims of both military and civil health services are the promotion of positive health and the prevention of disease. In the Army, these are pursued by the Medical Officer in charge of troops with equal or even greater fervour than those in the curative field. In the civilian service at present there is a distinct barrier between the Public Health Officer and the General Practitioners working in his area. This is altogether undesirable. It is hoped that under the new Act, and with the changing curriculum of undergraduate medical education, a new outlook will develop and more co-operation will follow between the two branches of the service. The Health Centre scheme, where both Public Health Officers and General Practitioners work under the same roof, and possibly share some of their duties, will undoubtedly be advantageous when it eventually becomes established.

The medical services in industry, as they exist at present, are independent of the National Health Service. Personnel selection, medical categorization, and the study of the effects of environment on industrial workers now play an equally important part in Industrial medicine as they do in the Army. Although not at present incorporated in the National Health Service, their work contributes very considerably to the maintenance of the health of a very important section of the population, and it is to be hoped that eventually such a service will be extended to cover workers of all categories.

Executive functions in the Army Health Service are mostly carried out by the Medical Officer in charge of troops. Specialists in Army Health are found at all administrative headquarters, and their function is to advise the Commander via the Senior Administrative Medical Officer on all matters pertaining to health in

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the area in which they are stationed. Also, they can advise and instruct directly all Medical Officers as to the best way in which measures of health maintenance are best carried out.

The civilian Medical Officer of Health, although in a position to advise his local council on health measures, is not really able to ensure that the general practitioners in his area are giving him every assistance in carrying such measures out, and can merely rely on the friendly co-operation of the doctors concerned.

Once again the essential differences in outlook between the two communities arise. By the one, health maintenance is regarded as of vital importance ; by the other it is considered merely one of the many functions of the social services.

Comparing the Health Services as detailed in Part III of the National Health Service Act, 1946, with their counterpart in the Army is of interest.

The Health Centre, as planned by the Act, is comparable with what now exists in the Army as the Medical Inspection Room. From the Health Centre the medical "team" is expected to work. The Family Doctor, the Public Health Officer, and his staff combine together to improve the health of individual families by both treating their sick and eliminating from their environment those conditions likely to be responsible for the causation of disease. The building is to be adequately fitted out and equipped for the purpose. It is to be made attractive and convenient both for the doctors and the patients. Dental services and other specialist services will also be at hand.

Maternity and Child Welfare clinics will be conducted therein, and the minor ailments of the schoolchild will be treated there, all as part of the family service. In addition, it is to be the base from which the health visitors will work, and also the centre for Health Education.

The Medical Inspection Room of the Army Medical Officer differs hardly at all in function. It is the place in which the Medical Officer co-ordinates his curative and preventive services. Treatment of the sick, medical inspections and categorizations, and protective inoculations all take place there. In a peace-time station, well-planned and well-constructed premises are provided. Equipment of a high standard is issued, which covers all requirements. A Dental Centre may function in the same establishment. Other specialist services are not provided as a rule, owing to the usual proximity of a general hospital, but the visit of a specialist to an outlying Medical Inspection Room to see cases is by no means an impossibility.

If there are families on the station, a Nursing Sister is provided, to carry out the duties of Health Visiting and Home Nursing, and it is most likely to be in the Medical Inspection Room premises that she will conduct the child health services.

Training in Health Education of the troops covered by a particular Medical Inspection Room is the duty of the Medical Officer in charge. Thus, the Medical Inspection Room is the Army's equivalent of the Health Centre in the true meaning of the word.

The Care of Expectant Mothers and Midwifery are, in the Army, the responsibility of the Families Wing of a General Hospital. Ante-natal and post-natal clinics are generally held in the hospital, although in outlying stations the

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officer in charge of the Families Wing, who is also the obstetrician, may arrange to visit the local Medical Inspection Room for the purpose, in which case he would have the assistance and co-operation of the Medical Officer in charge and the Nursing Sister attached to the Medical Inspection Room.

The Health Visitor and Home Nursing Services again only apply to Army families, and they are also provided by the Sister for the station.

The provision of vaccination and immunization services is of great importance in the Army. This again is the duty of the Medical Officer in charge of troops, though he can be ably assisted in getting the work completed by the Commanding Officer of the unit concerned. These measures are not compulsory in the Army, but a good unit spirit can be relied upon to get the highest degree of protection as possible.

The provision of preventive measures against disease is again an important duty of the Medical Officer in charge of troops, assisted by the Specialist in Army Health. The care and after-care of all sick in the Army is undertaken by the Hospital and Rehabilitation Services, and so those duties do not fall to the lot of the Medical Officer in charge of troops. Great importance, however, is attached to the restoration to duty of a sick or wounded soldier, although if as a result of illness or injury he is rendered unfit for further service his future medical care becomes a civilian responsibility.

Health education again is regarded as a very important duty of the Army Health Service. Undoubtedly much more attention is given to it in the Army than is done in civilian life at present, although it is becoming an increasingly important item in the curriculum of the schoolchild. In order to achieve the Army's object of maintaining high standards of health it is essential that every member knows how to keep himself in good condition, and how to avoid the diseases he is likely to come across.

The education in health that every man is at present getting during his period of National Service will undoubtedly be of great value both to himself and the rest of the community in the future.

With regard to Environmental Health, the Medical Officer in charge of troops has clearly defined duties, and powers to carry these duties out.

He has the right of entry to all premises occupied or used in any way by the personnel of the Army for whom he is medically responsible, at any time when he wishes to make an inspection. It is, of course, customary for him to visit the Commanding Officer of the unit concerned before entering any such premises, and it is usual for either the Commanding Officer or a deputy to accompany the Medical Officer on his inspection. This enables matters to be discussed on the spot.

It is his duty to inspect cookhouses, the personnel employed therein, food stores, living accommodation, working conditions and recreational amenities, and he must comment on his findings to the Commanding Officer and, if necessary, confirm his remarks in a written report when action needs to be taken to rectify some matter that he considers might ultimately be deleterious to the health of the troops.

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With a large crowd of men living together, feeding communally, and several sleeping in one room, he must constantly be on the look out for anything likely to precipitate an epidemic. Lack of hygiene in the cookhouse, in the preparation or storage of food, may lead to a food-borne outbreak; overcrowding and bad ventilation in the barrack rooms may encourage the spread of a droplet infection. Dirty latrines may allow flies to spread disease.

Welfare amenities must constantly be kept under observation. This is especially important in the present days of National Service, when a large number of men are in the Army involuntarily, and their outlook is undoubtedly influenced by this fact. Lack of amusements within the barracks and unit lines leads to the men seeking their fun elsewhere, with a consequent increase in the rate of drunkenness and venereal disease, complaints to which young virile men with nothing much to do in the way of amusement or interest are particularly prone.

Civilian life does not present quite the same problems, although the environmental problems mentioned above of course arise in any form of communal or institutional life, and the same degree of supervision is exercised by Medical Officers in charge of schools and institutions, with the same objects.

Inspections of premises, although carried out with the object of improving the living conditions of the civil population, are not such an important matter of routine as they are in the Army, and are generally made for a specific purpose, such as the investigation of a "nuisance."

The keeping of records of disease or injury of all types, however trivial, is a comparatively easy matter in the Army, as the entire population is accurately known with regard to size and distribution. Medical reports and returns can be produced with comparative ease by the Medical Staff of any formation. Thus accurate statistical records covering disease incidence rates, hospital admissions, length of stay in hospital, results of treatment, etc., can be compiled. Field trials of new equipment and investigations of groups of men with regard to physiological and psychological problems can readily be carried out. The Army Medical Service is therefore constantly in a good position to review the results of its works.

In civil life the accurate recording of disease in the community is generally a difficult matter, and only hospital records and notification of certain diseases can be relied upon to provide the necessary data. Recent social surveys have been undertaken to investigate the incidence of disease as a whole, and no doubt in years to come the National Health Service will require the keeping of far more exact records of all types of disease than are kept at present.

Thus while the Army is always able to give an up-to-date picture of its over-all state of health, the civilian community cannot do so with the same accuracy, relying on such indices as the vital statistics and incidence of certain specific diseases only.

[*To be continued.*]

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

BY

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[*Continued from page* 131, *February issue*]

PART TWO

Urinary Antibodies

1. Incidence

(*a*) *Carriers*

It has been shown that specific flagellar anti-bodies against the species which the person was excreting could be demonstrated in the urine of all the carriers here classified as chronic.

The possible value of this observation depends on two further factors: (1) The regularity with which antibodies could be demonstrated in urine specimens. This has already been considered, but will be further discussed below. (2) The occurrence of antibodies in the urine of controls, which remains for consideration.

(*b*) *Control Group: All Indigenous Foodhandlers*

Antibodies were found in the urine of 6.1 per cent. of the foodhandling population under investigation, when single specimens (generally consisting of a

Table VIII.—Incidence of Urinary Antibodies in Samples of the Urine of Foodhandler Controls*

Group	No. of Persons tested	No. with Urinary Antibodies +	Percentage +
Unselected	741 (738)	45 (42)	6.1 (5.7)
Schistosoma ova present on first examination	89 (88)	13 (12)	14.6 (13.6)
Schistosoma ova absent on first examination	588 (586)	27 (25)	4.6 (4.3)
No record of examination for schistosoma ova	64	5	7.8

* *Note to Tables VIII and IX.*—Corrected figures resulting from the exclusion of three excretors detected later from the control group are given in brackets in the appropriate places in the tables.

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pool of three samples taken on successive days) from a proportion of them (when possible every fifth) were examined. Details are recorded in Table VIII, while the distribution of individual antibodies is shown in Table IX. Three of these persons were subsequently shown to be excretors of *S. paratyphi A*. Figures corrected by the exclusion of these three from the control group are also given (in brackets) in these tables.

2. Frequency with which Antibodies may be Demonstrated

The frequency with which urinary antibodies are demonstrable in the urine of carriers and others will obviously depend to some extent on the lowest degree

Table IX.—Distribution of Individual Specific Antibodies present in the Urine of Foodhandler Controls*

Persons on first test showing	Antigen	No. of Persons
Antibodies to one antigen only	*a*, *b*, *c*, or *d*	26 (25)
	a	5
	b	9 (8)
	c	0
	d	12
Antibodies to more than one antigen	All combinations as below	19 (17)
	a, *b*, *c*, and *d*	3
	$a+b$	2
	$a+d$	2 (1)
	$b+c$	1
	$b+d$	4
	$a+b+c$	1
	$a+b+d$	6 (5)
Antibodies to a specific antigen either alone or associated with another or others	*a*	19 (17)
	b	26 (24)
	c	5
	d	27 (25)

of dilution employed in the test and on the concentration of the urine. The possible influence of *p*H must also be considered.

(*a*) *Titre*

It is shown in Table V that homologous urinary antibodies were demonstrated at a titre of 1/2 or over in 84 of 100 examinations on chronic carriers, the range being from 69 to 100 per cent. in the six carriers on whom 10 or more tests were performed. This incidence is higher than that recorded for the same individuals in Tables I and II where more examinations with a lower ratio of positive results, ranging from 59 to 91 per cent., are shown. The reason for this discrepancy is that for a considerable period of time during which these individuals were under observation tests were not carried out at a dilution below 1/4. The figures in Tables I and II record the results of all tests and indicate the over-

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all proportion of positives; those in Table V record results of those tests in which 1/2 was the lowest dilution. In Table X the proportion of over-all positive tests, the proportion of positives among the tests commencing at 1/2, and the proportion of positives reaching or exceeding a titre of 1/4 in any test, is recorded for 14 carriers. Similar differences are indicated in Fig. 1 by symbols. The number of consecutive occasions upon which specimens from chronic carriers failed to show antibodies at 1/4 and at 1/2 has been already recorded, the longest series of consecutive negatives being eight and three respectively.

For 651 members of the control group, the lowest dilution of urine tested was 1/4; 39 (6.2 per cent.) tests were positive at 1/4 trace or over. Specimens

TABLE X.—CARRIERS: SCHISTOSOMIASIS: URINARY AND SERUM "H" ANTIBODIES

Ref. No.	Species carried	Schistosoma Ova +/No. Tests	Urinary Antibodies: Homologous: Over-all Tests % + (or ratio if tests < 10)	Homologous: Positive at 1/4 or higher Titre: +/No. Tests	Homologous: Positive at 1/4 or higher Titre: %	Homologous: Positive at 1/2 or higher Titre: +/No. Tests	Homologous: Positive at 1/2 or higher Titre: %	Homologous: Highest Titre recorded	Heterologous: Over-all Tests % + (or ratio if tests < 10)	Heterologous: Highest Titre recorded (Antigen)	Serum Antibodies: Highest Homologous Titre	Serum Antibodies: Highest Heterologous Titre (Antigen) 0 = < 1/25
1	T	6/23	63	11/27	41	12/16	75	1/10	3.7	1/4 (*a* & *b*)	1/500	1/500 (*a*)
2	T	7/23	59	11/29	38	11/16	69	(2) 1/20	17.2	1/10 tr. (*b*)	1/50	0
4	T	0/24	64	15/25	60	7/10	70	(2) 1/20	56	1/16 (*b*)	1/500 tr	1/1000 (*b*)
5	A	5/20	68	10/19	53	8/9		1/64	0		1/100	0
9	A	22/32	65	13/23	57	12/14	86	1/32	0		1/250	0
10	T	11/13 (1)	75	14/24	58	16/16	100	(2) 1/20	8.3	1/4 (*b*)	1/250	1/250 (*b*)
19	A	10/13	91	6/11	55	10/11	91	1/4	0		1/250	0
20	T	13/13	6/6	4/6		6/6		1/5	1/4	1/4 (*a* & *b*)	1/2500	0 (3)
21	A	8/8	1/1	1/1		1/1		(2) 1/25	0/1		1/250	
22	T	0/12	1/1	1/1		1/1		(2) 1/25	0/1		1/500	
Totals*		82/181	69	86/166	52	84/100	84		23			
12	A	7/28	53	7/16	44	5/11	45	1/12.5	0		1/250	?
13	T	0/8	73	3/11	27	8/11	73	1/4	0			
17	T	4/5	5/5	4/5		5/5		(2) 1/20	1/5	1/2 (*a*)		
18	A	4/5	100	9/10	90	10/10	100	(2) 1/20	10	1/2 (*d*)	1/2500	1/250 (*b*)

* Or averages for above *chronic persistent carriers.*

Notes: (1) Only tests before treatment here recorded (see note on Table I). (2) Highest dilution tested. (3) Tested only for antibody to antigen *a*.

from the remaining 110 persons in this group were tested at 1/2. If 1/2 trace readings are excluded, 6 (5.5 per cent.) were positive. This gives the combined figure for these two series of 45 (6.1 per cent.) positive at or over 1/4 trace or 1/2. Readings of 1/2 trace were found in six further specimens in the second series; agglutination at 1/4, however, was observed only three times.

(*b*) *Urine Concentration*

Since urine concentration varies with fluid intake and climate, these factors are liable to affect the urinary antibody titre. In schistosomiasis most of the blood passed is found in urine samples taken towards the end of micturition. Antibodies derived from this blood will thus also be increased in terminal samples.

Most of our tests were carried out in the cooler months on whole (not terminal)

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specimens. We therefore consider that, though the proportion of positive antibody tests in the general population might rise under conditions favouring urine concentration, the proportion of positive results from carriers is unlikely to fall below that found by us as a result of any general seasonal fall in urine concentration.

(*c*) ***Reaction***

Acid Agglutination.—The acid reaction of normal urine and the sensitivity of enteric group organisms to acid agglutination suggests the possibility that non-specific agglutination was the cause of some or all of the results which we have attributed to specific antibodies in the urine. The different effects of single

TABLE XI.—ACID AGGLUTINATION

Michaelis' Solution No.	Acid/Alkali Content per 100 ml.		*p*H after Dilution 1/4 as for Test				Agglutination												
			Diluent				*Distilled Water Wash used in *p*H Tests				Standard "H" Suspension								
											Whole Suspension				Supernatant after Centrifuging				
							Reported (Michaelis)		Observed										
	N/1 NaOH	N/1 Acetic Acid	Distilled Water	Physiological Saline	*S. typhi* Susp.*	*S. para. A* Susp.*	T	"Paratyphoid"	T	A	T	A	B	C	T	A	B	C
1	5 ml.	7.5 ml.	4.60	4.57	4.94	4.63			—	—	—	—	—	—	—	—	—	—
2	5 ml.	10 ml.	4.37	4.45	4.63	4.45	±		+	—	—	—	—	—	—	—	—	—
3	5 ml.	15 ml.	4.10	4.22	4.60	4.27	+		+	—	tr.	—	tr.	—	—	—	S –	—
4	5 ml.	25 ml.	3.60	4.25	4.43	3.97	±		tr.	—	S	—	S –	—	tr.	—	S	—
5	5 ml.	45 ml.	3.22	4.07	4.13	3.63		+	tr.	tr.	S +	—	S –	S –	tr.	—	S –	tr.
6	5 ml.	85 ml.	2.77	3.93	3.03	3.47		+	tr.	tr.	S +	S	S	S +	S –	S	tr.	S –
Saline control									—	—	—	—	—	—	—	—	—	—
Distilled water control			4.94	4.88	6.19	5.01												

* Bacterial suspensions consisted of six slopes washed off in distilled water and made up to 120 ml.

specimens on different bacterial species does not exclude such an explanation, since Michaelis (1915) pointed out that different bacteria are affected by fluids of different acidity and that *S. typhi* and the paratyphoid species differ in this respect.

On the other hand, the degree of correlation between the species carried and the antibodies present in carriers (Tables V and X), the frequent occurrence of antibodies in relatively high titre (when acidity of the reacting system due to urine content is reduced by its dilution) and the effective use of urinary globulin solutions (Archer *et al.*, 1950) render such an explanation of the effects observed inadequate. Nevertheless *p*H determinations were made on solutions prepared according to Michaelis' formulæ, and the agglutination of distilled water suspensions of *S. typhi* and *S. paratyphi A* and of standard agglutinable "H" suspensions by these solutions was tested. Results are recorded in Table XI.

The findings of Michaelis were confirmed. The effect of rising acidity on standard broth suspensions, however, differs from that on suspensions in distilled

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water. Flocculation of broth suspensions only commences with solution 3 and then increases as acidity rises.

Flocculation also occurs with the supernatant broth after standard suspensions are centrifuged. This may be due to action upon broth ingredients, dissolved bacterial constituents, or separated flagella.

The reaction of a series of urine specimens sent for culture varied between *p*H 4.8 and 8.0. That of urine freshly passed by carriers lay between *p*H 5.5 and 7. Comparison with the *p*H of flocculating solutions shown in Table XI suggests that non-specific acid agglutination will very rarely represent a source of error in interpreting urinary antibody tests.

Optimal pH.—Naylor (1951) has shown by adjusting the *p*H of samples that, though excess acid may give rise to non-specific flocculation, the sensitivity of the test for antibodies in neutral or alkaline urines may be increased by a suitable ajdustment of the *p*H.

Adjustment to *p*H 6 (approx.) has now been introduced in routine tests in our laboratory.

Deterioration of Antibody.—Titration on the day following detection of urinary antibodies has not infrequently indicated an apparent deterioration of effective agglutinin on keeping, even in the cold. The possibility that reaction was the cause of the change was considered. Two portions of a urine sample having a titre of 1/8 were adjusted to *p*H 5 and 7 respectively and stored in the cold. The titre of both specimens remained unimpaired for nine days. That of the neutral sample then began to fall and a test four days later only gave a trace reading at 1/2. The acid sample showed no change of titre or *p*H after sixteen days. Thus, though the comparative result may have been influenced by the contamination with *Ps. pyocyanea* of the neutral sample which was later detected, antibody stability in the acid urine indicates that *acidity* was a most unlikely cause of any deterioration of effective agglutinin previously noted.

3. Diagnostic Value of the Demonstration of Antibodies

(*a*) *The Presence of Urinary Antibodies in the Urine of Carriers*

(i) We have shown that antibodies can be detected in the urine of chronic persistent carriers of enteric group organisms among inoculated foodhandlers in Egypt, and that the frequency with which they can be demonstrated is not greatly below the frequency with which positive cultures occur. Three consecutive negative tests are rare by either method of examination.

(ii) Antibodies were present on occasions in the urine of four intermittent carriers. They were demonstrated rather more often than cultures were obtained during periods when the latter were generally negative, and two of these cases would be less likely to escape detection by the use of this test than by culture during such periods, though in one case the antibodies present were generally heterologous and hence fortuitous. It is also of interest that in two of the cases the appearance of antibodies synchronized with one of the infrequent positive cultures. This might be explained by a closed vesical lesion becoming superficial

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and discharging into the urine both organisms, which had been multiplying, and antibody-containing plasma.

(iii) Antibodies were not detected in the urine of the two carriers of *S. paratyphi C* tested, though one was an intermittent carrier (not proved chronic). This may be related to the fact that primary sensitization to antigen *c* had not been produced by inoculation.

(iv) Antibodies were not detected on single examinations of a transient carrier of *S. paratyphi A* or of a mixed carrier of *S. typhi* and *S. paratyphi A*, trace of whom was subsequently lost.

(*b*) *The Follow-up of Persons in whose Urine Antibodies* (*or Schistosoma Ova*) *had been Demonstrated*

Persons in whose urine antibodies, schistosoma ova, or both were found when sampling routine specimens were, when possible, followed up by culture of

TABLE XII.—S. PARATYPHI A EXCRETORS DISCOVERED ON RE-EXAMINATION OF INDIVIDUALS FOUND TO BE EXCRETING AGGLUTININS IN URINE

No.	Original Test			Re-examination					
	Homologous Titre	Heterologous Antibody		Agglutination at 1/4			Culture +/No. Exams.	Schistosoma ova +/No. Exams.	RBCs. +/No. Exams.
		Antigen	Titre	Antigen	Times +	No. of Exams.			
1	1/4	*d*	1/4	*a*	3	5	1/8 (i)	0/5	5/5
2	<1/4	*b* (iii)	1/8	*b* (iii)	2	5	1/6 (ii)	2/5	5/5
3	1/4	*b* and *d*	1/4 and 1/4	*a*	5	8	8/8	0/8	8/8

Notes: (i) Found at seventh examination. (ii) Found at second examination. (iii) In this case an excretor was detected through follow-up of a finding which proved to have been heterologous and fortuitous.

eight further specimens. These specimens were also examined for antibodies and ova.

(i) *Detection of Carriers by Follow-up.*—By this means three excretors of *S. paratyphi A* were detected. Details are given in Table XII.

(ii) *Other Observations.*—Follow-up findings in respect of twelve other persons not thereby proved to be carriers are recorded in Table XIII. It will be noted that:

(*a*) Though five persons were investigated on account of the presence of ova alone and antibodies were absent on primary test, only two of these (Nos. 5 and 12) showed an absence of antibodies throughout. Of the other three, however, only one (No. 4) aroused suspicion regarding carriage by the constant presence of high titre antibody to a single species.

(*b*) Of the five cases followed up on account of the presence of antibodies but who were not noted to pass ova on first examination, none showed schistosoma ova in later specimens, three did not pass antibodies again, and agglutination results for one only (No. 8) suggested carriage.

(*c*) The remaining two persons, in whose urine both ova and antibody were found on first examination, showed the regular presence of high titre antibodies

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in further specimens. No. 2 was suspicious since antibody to antigen *d* only was regularly present and of high titre. No. 3 was not considered suspicious since, though of high titre and constant, all three antigens against which these people are immunized by inoculation were represented by their antibody to a similar degree.

(*d*) No antibodies to antigen *c* were detected.

Thus three cases in all, Nos. 2, 4 and 8, aroused suspicions of carriage not substantiated by culture. The possibility of intermittent carriage by them remains, and the almost constant presence of *Ps. pyocyanea* in the urine of No. 8 may have interfered with the isolation of an enteric group organism.

4. Source of Urinary Antibodies

Possible sources of urinary antibodies are :

Blood Plasma entering the urine (i) by transudation through the renal glomeruli, (ii) by exudation from vesical lesions.

Local formation in lymph glands or in lesions.

A combination of two or more of the above.

TABLE XIII.—PERSONS NOT PROVED AS CARRIERS BY FOLLOW-UP EXAMINATIONS AFTER A POSITIVE TEST FOR URINARY ANTIBODIES OR OVA OF SCHISTOSOMA

Case No.	No. of Exams. (all cultures negative for enteric species)	Reasons for Exams.	Ova: +/No. of Exams.	Urinary Antibodies: Positive (i) No. + (ii) Highest Titre — Antigen *a* (i)	Antigen *a* (ii)	Antigen *b* (i)	Antigen *b* (ii)	Antigen *c* (i)	Antigen *c* (ii)	Antigen *d* (i)	Antigen *d* (ii)	All Negative: No./No. of Tests
1	8	Ova +	1/8	0		0		0		4	1/2	4/8
2	5	Ova +										
		Antibody to *d* 1/2 tr.	3/4	2	>1/4	2	1/2	0		4	1/20	0/4
3	8	Ova +										
		Antibody to *b* 1/2	3/8	8	1/20	8	1/20	0		8	1/20	0/8
4	7	Ova +	5/6	0		0		0		7	1/20	0/7
5	8	Ova +	2/8	0		0		0		0		8/8
6	8	Antibody to *b* 1/2 tr.	0/8	0		1	1/2	0		0		7/8
7	7	Antibodies to *a* and *b* 1/2 tr. to *d* 1/2	0/7	0		0		0		0		7/7
8	8	Antibody to *a* 1/20	0/8	8	1/10	1	1/2	0		1	1/2	0/8
9	7	Antibody to *d* 1/2 tr.	0/7	0		0		0		0		7/7
10	8	Ova +	7/7*	3	1/4	3	1/4	0		1	1/2	3/7
11	8	Antibody to *d* 1/2	0/8	0		0		0		0		8/8
12	8	Ova +	7/8	0		0		0		0		8/8

* Macroscopic blood at times.

Further work on this problem is being carried out, but evidence from the literature and from the data presented above will be briefly discussed here.

(*a*) *The Blood Plasma*

That at least a proportion of the antibodies detected in urine are derived from the blood plasma is indicated—(i) by the presence of heterologous antibodies in the urine of carriers (Tables V and X) ; (ii) by the presence of multiple antibodies in the urine of foodhandlers (Table IX), since it is extremely unlikely that seventeen individuals not demonstrated to be carriers were responding locally to multiple antigens localized in the urinary tract ; (iii) by the relative proportion of findings of schistosoma ova on first examination of foodhandlers

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passing antibodies to similar findings on first examination on the general population concerned (Table VII (*f*) and (*e*)); and, conversely, (iv) by the difference between incidence of occurrence of urinary antibodies in the unselected population, in persons having demonstrable ova in their urine and in persons in whose urine ova were not detected (Table VIII). A difference in antibody instance of the order of that found in the last two groups but occurring in slightly larger samples would be statistically significant.

The findings referred to at (iii) and (iv) are, of course, in favour of exudation from the lesions of schistosomiasis rather than glomerular transudation.

An association between the almost universal absence of antibody to antigen *c* from urine, even from that of carriers, and the absence of this antigen from the vaccine used for their immunization, would seem, at first, to support the idea of either glomerular or vesical transudation or exudation of serum antibody, and to be opposed to the hypothesis of local antibody production. If all urinary antibodies are derived from the blood, the only reason for their more frequent appearance in demonstrable concentration in the urine of carriers than in that of others with lesions from, or through, which antibody can leak would seem to be the higher titre produced in the blood by active carriage than by inoculation. The latter, however, may be adequate to give rise to the passage of detectable antibody at times. Inoculation may also cause an enhanced and more rapid serological response to infection, with a consequent early raising of the titre of urinary antibody to a demonstrable level. If, on the other hand, antibodies are produced locally, correlation between their appearance and past inoculation (as suggested above to explain findings regarding *S. paratyphi C* antibody) does not at first seem applicable.

Oakley, Warrack and Batty (1949 and 1951), however, find that *local* antibody production follows a secondary stimulus, while no measurable local response may result from a primary one. Infection with, and early carriage of, *S. paratyphi C* represents a primary stimulus in these people since inoculation stimulation with this species has not occurred.

No chronic *paratyphi C* carrier is here reported. Antibodies were present in the urine of the apparently chronic carrier of *S. paratyphi C* described by Archer *et al.* (1950). Chronic carriage may produce multiple or continuous stimuli.

(*b*) *Local Formation*

Oakley *et al.* in a review of the literature and an account of their own work indicate that local production of *S. typhi* antibody may occur; that antitoxin is produced in lymph nodes draining an area secondarily injected with toxoid, and that antitoxin is also produced in the injected tissue itself when skin, fat, or voluntary muscle receive a single such secondary injection. They suggest that antibody at these tissue sites may be produced by connective tissue cells or cells of the local granuloma which develops rather than by the specific tissue cells. They found no evidence of antibody production in the kidney, but unless this may occur it is difficult to explain the findings of Burrows and Havens (1948) that,

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in actively immunized guinea-pigs, the peak of the antibody titre in urine precedes that of blood antibody.

It seems possible to us that invasion of the local lesions of schistosomiasis (or of an infective lesion of the bladder) by enteric organism might give rise to local antibodies to the invading species being produced there, and carriage thus be directly as well as indirectly associated with urinary antibody production.

One of us (A. P. G.) attempted the investigation of this hypothesis after the manner of Oakley *et al.* by the immunization of carriers to a heterologous salmonella "H" antigen by the subcutaneous route, with a view to later study of the ratio between serum and urine antibodies to this and to the "H" antigen of the carried species. This attempt failed as serum titre to the heterologous antigen did not develop to a sufficiently high degree. The work is being continued, but certain indications that local antibody production has occurred in some of the carriers studied may be noted from the data already presented in Tables V and X, inoculation having afforded the heterologous subcutaneous stimulus, thus:

(i) Chronic carriers No. 1 and No. 10 passed antibodies to *S. typhi* (the species carried) much more regularly and to higher titre than to *S. paratyphi A* and *S. paratyphi B* respectively, though serum titres were the same for the carried and the other species in each case.

(ii) Chronic carrier No. 4 likewise showed antibody to homologous *d* slightly more frequently than to heterologous *b*, and the highest titre recorded for *d* was slightly above that for *b*, though serum titre for *b* was higher than that for *d*.

(iii) Chronic carriers Nos. 2, 5 and 9 showed a ratio of homologous antibody in urine and serum which is difficult to explain on the basis of a serum leak alone. The presence of heterologous antibody in the urine of the first of these, however, also presents an anomaly in view of its absence at 1/25 from the serum.

It thus appears likely that antibody present in the serum exudate from bladder lesions is supplemented by antibody actively produced in such lesions.

[*To be continued.*]

ERRATA.—In Tables I, II, III and IV, on pages 42 and 44 (first part of this article) substitute "Time under observation" for "Observed duration" in the heading of column 2 of each table. In Table VI, page 126, in column 1, under "9," after "Pool of" add "7, 8 and 9." In the same line delete "7, 8 and 9" from column 2.

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HEALTH IN THE ARMY

BY

Major BRIAN DEVLIN, M.B., Ch.B., D.P.H.
Royal Army Medical Corps

[*Continued from page* 142, *February issue*]

Prevention of Disease

As stated in the Introduction, consideration of the many detailed methods of control of preventible disease is without the scope of this dissertation. The two main groups of diseases with which the Army Health Service is concerned are the Environmental and the Communicable; the measures adopted for their prevention and control may be classed as General, which have already been discussed under Promotion of Health and Specific, which are of course equally applicable to civilian life. Environmental disorders of particular interest to the Army include the effects of heat, cold and fatigue, certain occupational diseases, dietary deficiencies and some psychiatric disabilities. Special health problems arise in the movement of troops by road, rail, sea and air.

With regard to the communicable diseases—those spread by the respiratory and alimentary routes, by contact, insects and animals, and by unknown or doubtful means—the regimen of Service life enables more thorough and effective measures to be enforced. At the same time, conditions are in some ways more favourable for the spread of many of these diseases, once they have been introduced into the community. For the latter reason, and in view of the additional hazards of overseas service, a high degree of protection by prophylactic inoculation and vaccination is desirable, while the former renders this administratively possible. All troops, other than objectors, are immunized against smallpox, enteric, tetanus and diphtheria, while yellow fever, typhus, cholera and plague vaccines are given as required. In addition, B.C.G. vaccination is now offered to all Regular personnel of the Royal Army Medical and Nursing Corps, and all recruits have chest radiographs either before or immediately after enlistment. Further preventive measures, of which the circumstances of Army life conduce to particularly favourable results, include safeguarding of food and drink supplies; control of foodhandlers; refuse disposal; supervision of Army swimming baths; suppressive treatment of malaria; control of infectious disease outbreaks in Army families; and pest control, for which the newer insecticides and repellents have proved of enormous value against flies, mosquitoes, lice, fleas, bugs and ticks.

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Medical Care

The provision of medical care for the sick in the Army is generally comparable to the civilian organization. Such differences as exist result from certain requirements peculiar to the Armed Forces. First, it is impracticable and undesirable to treat bed cases in barracks, therefore many cases which would be nursed at home in civil life must be admitted to medical units. Similarly, hospital cases cannot be discharged to their units until they have reached a more advanced stage of convalescence than comparable civilian patients. On the other hand, the Services consist, for the most part, of fit men in the prime of life, hence no provision is necessary for the aged and little for chronic sick. Such cases, including psychiatric and tuberculous sufferers, are medically boarded from the Army and transferred, when further treatment is required, to appropriate civilian institutions. Secondly, standardization of units—establishments, equipment, organization and training—is essential in the Army to allow free interchange of personnel and replacement of casualties. This does not, of course, extend to professional methods ; every medical officer is fully entitled to use his discretion in matters of diagnosis and treatment, subject at times to directives issued by consultants for the guidance of their less experienced colleagues, or to enable controlled investigations of selected methods to be carried out

Reference will now be made to certain aspects of medical care which are more or less peculiar to the Army.

Medical Units

The Army equivalent of the doctor's surgery is the Medical Centre, previously called the Medical Inspection Room, consisting of consulting room, separate waiting and treatment rooms for the sexes, store and sanitary annexe. These Centres are situated in large camps or barracks and normally cater for units of battalion or equivalent size. Their functions are the treatment of minor ailments, medical inspections and examinations, and inoculations and vaccination.

Between the Medical Inspection Room and the Military Hospital is a medical unit with no exact civilian counterpart : the Reception Station. Ranging in size from 10 to 100 beds and under the charge of a non-specialist medical officer, this is designed for the care of minor sick who require a short period of in-patient treatment without specialist attention.

The organization of a Military Hospital is basically the same as that of any civil non-teaching hospital of comparable size, except that the Commanding Officer is invariably medically qualified. The main difference has been that nursing duties were performed by male orderlies directed by ward sisters. The newly constituted Queen Alexandra's Royal Army Nursing Corps has now commenced to recruit women other ranks, many of whom, it is intended, will train in the wards of military hospitals, replacing some of the male orderlies.

Evacuation Services

In civilian practice the provision of an ambulance service should present no great difficulty—the patient, as a rule, has only to be transported from his home

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to a neighbouring hospital. Much more complex are Service requirements: not only have patients to be carried long distances in this country owing to the scattered locations of military units, but also numbers have constantly to be brought home from overseas stations, even in peace time. Briefly, road transport is provided by motor ambulance cars of the Royal Army Service Corps, operating under medical control; ambulance trains and ward rail coaches are not normally required in this country in peace time, nor are hospital ships employed; invalids from overseas are evacuated in ships' hospitals of troop transports and in transport aircraft, fitted with stretchers as needed, of the Royal Air Force.

Rehabilitation

A most important object of medical care of the sick, which has frequently received insufficient attention in the past, is restoration to full, or maximum possible, efficiency. Rehabilitation should not be considered, as is so often the case, as a problem quite apart from the specific treatment of an individual illness—as something rather vague, to be left to the physiotherapist—but active measures, directed at the restoration of both physical and psychological health, should be undertaken just as soon as the patient is in a condition to benefit by them. In many cases there is no logical reason why active treatment of this nature should not commence on the day the patient is admitted to hospital; for example, pre-operative exercises in "cold" surgery. In cases of injury, restoration of full function of the part or limb is, after surgical treatment, largely in the province of physical medicine, while well-planned diversional therapy can be a valuable stimulus to psychological recovery. Both medical and surgical cases usually require restoration of respiratory and cardiovascular efficiency—a process which can best be carried out by graduated physical training at a Convalescent Depot or Convalescent Wing of a General Hospital.

At both of these establishments extra rations are supplied, and qualified instructors of the Army Physical Training Corps, under the direction of medical officers experienced in this type of work, undertake the reconditioning of the sick and of badly underdeveloped recruits by graduated training, culminating in the Standard Test. Separate classes are held for orthopædic injuries. Much of the value of sending a man to a convalescent depot lies in removing him from the aimless routine of hospital atmosphere at the earliest possible stage in his recovery, hence every effort must be made to prevent boredom by providing variety in working hours and adequate recreational facilities outside them.

Further facilities for rehabilitation, as already mentioned, are afforded by Command Conditioning Courses, also organized by the Army Physical Training Corps in conjunction with Physical Medicine Specialists. Whilst primarily for underweight recruits, other categories of men derive much benefit from these courses, especially those who break down in training for no discernible reason, men transferred from sedentary to active occupations, run-down instructors, and sufferers from "blackouts," effort syndrome, mild degrees of foot strain or multiple vague complaints due to poor physique, low morale or lack of self-confidence. At the end of the course a firm PULHEEMS assessment is allotted.

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Research

The foregoing account gives some indication of the many and varied factors influencing the health of the modern soldier. It is opportune, therefore, to consider briefly the organization and resources available for investigation of some of the problems which are constantly demanding solution.

In order to make the best possible use of these resources, and to avoid reduplication, close co-operation is maintained with the Ministry of Supply, the Royal Navy and Royal Air Force, and, in some matters, with Allied Powers. Thus physiological research is directed by the Military Personnel Research Committee, consisting of the Scientific Adviser to the Army Council, civilian consultants in applied physiology, and representatives of the Royal Navy, Royal Air Force, Medical Research Council and Ministry of Supply. Sub-committees are formed to deal with such matters as ascertainment of problems, environmental physiology, clothing and equipment, steel helmets and body armour. The Army has no experimental physiological laboratory of its own; but Army physiologists carry out practical work at the Ministry of Supply laboratory, where long-term projects, such as the physiology of clothing, are investigated, and at the Ministry of Supply Field Test Centre. Problems of an operational short-term nature are dealt with by the Army Operational Research Group, which is controlled by the Scientific Adviser to the Army Council. Examples of projects undergoing investigation at the present time include development of a satisfactory pattern of tropical boot, and of general purpose goggles to protect against dust, sand, sun and snow-glare; investigation of the causes of traffic accidents and of inflammability of clothing materials; improvement of load-carrying equipment; and detection of incipient breakdown under active service conditions. Some of the projects completed recently, such as combat suits and tropical clothing, have been mentioned earlier in the context.

Recently an Inter-Services Tropical Research Unit has been formed by the Medical Research Council at Singapore to study Service problems encountered in the tropics, while cold climate investigations are pursued by Canadian and United States authorities. Such problems as sea sickness are of prime interest to the Royal Navy, hence that Service undertakes research on behalf of all three; the requirements of tank crews for ventilated tropical underclothing are very similar to those of aircrew, thus the Royal Air Force experiments with that project.

Research into water purification methods is co-ordinated by the Inter-Services Advisory Panel on Purification of Water Supplies in the Field, and much valuable work on this subject has been carried out by the Department of Army Health. Development of vaccines is undertaken by the Army Vaccine Laboratory, insecticides and repellents and field sanitary equipment by the Royal Army Medical College and the Army School of Health. The composition, packing and storage of rations is a joint responsibility of the Medical and Supply branches of the War Office; whilst the former, in conjunction with the Royal Army Medical Corps Field Training School, also experiments with new medical equipment.

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Meanwhile, clinical research is, of course, being continually carried on in Service hospitals and laboratories, in close harmony with the professional institutions and learned societies.

Future Developments

Turning to possible developments affecting both servicemen and civilian, the first which might be considered is the extensive application of personnel selection methods to industry. Similar systems are in fact used to some extent, for example in the Youth Employment Service, but the day can be imagined when numbers of industrial occupations will have their PULHEEMS employment standards.

Active rehabilitation methods are widely used under the Disabled Persons (Employment) Act, and in certain heavy industries, but the provision of large numbers of convalescent centres for hastening recovery of the ordinary sick and injured civilian is obviously far beyond the national resources at present. On the other hand, closer integration of Army and civilian health education is a practical proposition which may be expected to progress.

Hoped-for developments affecting the health of the soldier include up-to-date housing for all troops and their families ; improved ration packs for operational service ; more effective insecticides and repellents ; more generous allowances of certain items of clothing ; vaccines to confer more solid immunity ; even more foolproof methods of water purification.

Finally, what of the future of the Service itself ? It is conceivable, in this age of over-centralization, that within the measurable future the Medical Branches of the three armed Forces will have been combined into one organization. Already there is, as there should be, a high degree of reciprocity in the facilities afforded by each to the members of the others, particularly at overseas stations, where medical cover is frequently provided for all by the numerically strongest service. Pay and promotion have been standardized, and the need for inter-Service co-operation was never greater. Indeed, the matter has been raised in Parliament on more than one occasion ; for instance, on 9th July, 1947, in the House of Commons the Defence Minister was asked what progress had been made towards merging the Medical Services of the Armed Forces. He replied that the question was "still under examination," but that it had not yet been established that the institution of a unified Medical Service was to be preferred to the maximum degree of co-ordination between the existing Services [29].

A further step would be integration with the National Health Service. Since the inception of this scheme the Forces have been made responsible for medical care of many British civilians—chiefly Foreign Service and other government employees—at stations abroad, while in the United Kingdom, owing to the shortage of Service doctors, increasing numbers of civilian practitioners are being employed to care for serving personnel. Furthermore, education, maternity and child welfare, general medical and dental services for military families in this country have already or are likely soon to be taken out of the Army's hands. Distinguished members of the profession in the House of Lords have advocated

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greater integration of the National Health Service, the Armed Forces and the Colonial Medical Services, including equality of conditions of entry and the same financial basis, no interruption of pension and other rights on transferring between the Services, the seconding of specialists from the National Health Service to the Forces, and the setting up by the Ministry of Health of formal links between National Health, Armed Forces and university representatives at Command levels [30].

Whilst the same noble lords have no desire to unify the Medical Services, there are undoubtedly champions of such ideas, who maintain that medical requirements are the same for all—at least in peace time—just as food and water and many items of equipment are common to all three Services, and point to the advantages of flexibility and economy of effort and resources which would be gained. On the other hand, huge administrative structures created in other directions have tended to be unwieldy and to negate the very objects for which they were brought into being, breeding waste, mediocrity and stagnation of personal effort. Besides, has it not been made clear that many aspects of Service medical practice differ considerably from those outside, and can be properly appreciated and dealt with only by men who have the required experience? Above all, it is imperative that cadres, highly trained in the specialized duties of each of the fighting arms, be maintained at all times ready for rapid expansion on the outbreak of war.

Surely, then, the only logical course is the middle one: each Service, Naval, Military, Air Force and National Health, while co-operating ever more closely with the others and offering comparable conditions of employment, at the same time to retain its individuality in administration, its customs and traditions, and thereby the initiative which results from comparative freedom of action.

Summary

Present conceptions of the functions of a Health Service are stated, and a short historical survey shows how these have evolved. Positive Health is defined, and the requirements for its attainment in the Army are postulated. Personnel selection procedure is outlined, followed by a detailed description of medical classification and an account of the treatment of underdeveloped recruits. Personal Hygiene includes Health Education and Environment, which are discussed in some detail. Brief reference is made to the prevention of disease, and medical care is described only in so far as it differs from civilian practice—namely, in the case of medical units, evacuation services and rehabilitation. Finally, a short account of present-day research is followed by some speculation about future developments.

Acknowledgments

The writer is indebted to the Director-General, Army Medical Services, for permission to publish this dissertation, and gratefully acknowledges the assistance he received from Colonel A. E. Campbell, Professor of Army Health,

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Royal Army Medical College; Lieutenant-Colonel C. L. Day, Assistant Professor; Lieutenant-Colonel J. B. M. Milne, *O.B.E.*, Adviser in Physical Medicine; and Major A. J. Buller, Army Medical Department, The War Office.

29. *Brit. Med. J.* (1947), **4515**, 116; "Parliamentary Debates (Hansard)" (1947), **439**, H.C. Deb., 5s., 2207.
30. *Brit. Med. J.* (1950), **4686**, 1005; "Parliamentary Debates (Hansard)" (1950), House of Lords, **168**, 1206.

Travel and History

U.S.A. *v.* HINDUSTAN

Memories of a New Year's Eve

EVENING of 30th December, 1944, found me at an American Military Hospital I was privileged to go over on the last day of my travels in "Burma." I was to leave for Delhi next morning by an American plane. In order to avoid an early morning jeep ride of some miles next day I was advised to spend the night at the aerodrome, where accommodation would be provided.

I arrived in the dark at a flood-lit camp, their jumping-off place over "The Hump." I pulled up in front of a basha. On announcing my identity to an official behind a counter which might have done credit to Thos. Cook at Berkeley Square, a bell was pressed and an Assamese boy, complete in buttons and pill-box cap, appeared, took my valise, and conducted me to an adjacent basha.

Having slept on Mother Earth except in places like Chittagong, Imphal, Kohima, what was my surprise when I found a bed complete with mattress, blankets, sheets, mosquito-net, bedside table with an electric reading lamp, thermos flask, a small collection of American literature and an announcer at the bed head. The official at the counter had apologized that I would have to use a communal washing place.

The communal washing place had rows of basins with hot and cold taps, cubicles with hot and cold showers and PULL the PLUGS.

Next morning while at breakfast it was announced that the plane for Delhi would be delayed till midday and passengers were advised to have a meal before start.

Having nothing to do till then I walked round to get a general idea of camp life U.S.A. I saw mechanical dish and cutlery washing machines and electrical cooking, power being generated from a lorry.

Landing near Calcutta and Agra to refuel, we arrived at Delhi aerodrome about midnight. A lady W.A.C.I. met me and drove me to an Indian princely palace functioning as a hostel, where I had been assigned accommodation.

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As soon as she had deposited me and my kit at the steps of the mansion I thanked her and told her not to waste her New Year's Eve waiting to see me fixed up as I would be all right.

The "chowkidar" took some waking, but I found the key of the room allotted to me and he led me to the room. On opening the door there was a bed with pyjamas and slippers laid out and the dressing table with the usual paraphernalia. The room was obviously in occupation by someone celebrating the New Year.

The "chowkidar" said every room was occupied and could not see what objection I had to the room he had shown me. I told him to go and find me a tum-tum. Strange to say, a tum-tum was obtained past 1 a.m., New Year's Day, 1945.

I drove to the Imperial Delhi Gymkhana Club and spent the night or rest of the morning in a Club E.P.I.P. tent in my valise. I did not complete the climax by having a tin bath, but braved the elements and had a long one in the club changing room ; to the credit of the management, hot water was on tap.

In 1946 at Melton Mowbray I received a bill from the G.E. for the room I did not occupy in the princely mansion. I have not received a reminder since 1947.

H. J. M. C.

MANAGER'S NOTICE

The Future of the Journal

Our readers will be aware that for some time past the Journal has been run at a financial loss, and that its termination or amalgamation had been forecast. The Journal Committee, as the result of further deliberation, have decided to continue publication as a quarterly. The Journal in its present form will cease with the June issue, and the first number as a quarterly will appear in the autumn.

In its new format the Journal will be entirely professional in character, and all Corps news, etc., which previously appeared in the Journal will in future be published in "The Army Medical Services Magazine," a copy of which will go to subscribers, together with the Journal, in one wrapper.

The annual subscription to the Journal in its new form will be 25s., which will include "The Army Medical Services Magazine" and postage. Trade subscription will be 20s. and will not include the Magazine.

The Committee strongly appeals to subscribers to give their continued support and to do all they can to encourage further subscriptions from brother officers who at present do not take the Journal.

Our Journal, which has meant so much to the Corps for wellnigh fifty years, has been saved from extinction ; only our subscribers can ensure that it flourishes.

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Matters of Interest

THE following officers passed the Examination for the Diploma in Public Health (Eng.) which was concluded on 15th January, 1952:

Major T. A. Pace, *O.B.E.*, R.A.M.C.; Major E. D. H. Williams, R.A.M.C.

NOTES FROM A.M.D.

BY OUR SPECIAL CORRESPONDENT

WE were particularly interested in two articles which appeared in the November number of this Journal. Perhaps that is why we read these articles with unusual care, the result of which has now led us to our opening remarks. These notes should not become a vehicle for criticism of our fellow-journalists, and so it is with some trepidation that we temporarily assume the mantle of literary critic. In that very readable article on a jungle operation in Malaya, under the heading "Individual Troop Investigation . . . I Troop," there appear brief notes of cases of illness which occurred. We were horrified to read of "One case of hæmaturia, urgency, right renal pain, pyrexia 130° F. (?), acute nephritis." We could appreciate the urgency, and wondered whether the mark of interrogation had an influence on the preceding or the subsequent words. Then we remembered the curious results we had experienced when we had allowed embryo nursing orderlies to take temperatures. This theory seemed untenable when we read that the author considered that "none (of the medical orderlies) had failed to repay the confidence placed in them." By this time our critical interest was fully aroused and we carefully heated some water to a temperature of 130° F. This experiment led us to the inescapable conclusion that the diagnosis by then must have been of academic interest only.

Although we may suspect a typographical error in the article we have referred to above, the same suspicion is not aroused by the notes on the reception and training of Z reservists, which appears in the same number of the Journal. We thought this was a most useful account of thoughtful planning and clockwork organization, and we wish to comment on only one phrase. We have always found initials confusing, but they are beloved of doctors and soldiers, and are therefore unusually rife in the R.A.M.C. In our young days I.D.K. was far more popular than it is now, and P.I.D. had not been invented. But we have always clung to the belief that F.F.I. stood for the words "fit and free from infection." It was no doubt this belief which made the phrase "Foot and Face Inspection" which appeared in the article seem so startling. Have we been doing

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it all wrong for so many years? We must admit to a pretty casual glance at foot and face, although we can boast of a grim concentration on the area roughly midway between. We guiltily think now of all the epidermophytosis and impetigo we may have missed, but we console ourselves with the conviction that not a single pediculus evaded our steely gaze.

After these vague meanderings let us now pass on to stern reality. Bring forth the Army List, old friend, and let us study progress. We are glad to be able to offer substantial alterations to the List this month. Colonel W. L. Spencer-Cox became a Brigadier on December 13, 1951, and Colonel R. J. Rosie was similarly promoted on January 1, 1952. The following Lieutenant-Colonels became Colonels on the dates shown: J. G. Black, November 29, 1951; A. N. T. Meneces, December 13, 1951; E. J. Curran, December 28, 1951. The following Majors became Lieutenant-Colonels on the dates shown: A. L. Pennefather, November 29, 1951; E. Gareh, December 13, 1951; J. McGhie, December 28, 1951; and G. F. Valentine, January 27, 1952.

We learn that in the Middle East the following changes have taken place since we wrote about it in the October number of the Journal. The Consulting Surgeon is now Colonel A. McMillan. The A.D.M.S., 1st Infantry Division, is Colonel T. M. R. Ahern, who has replaced Colonel W. A. Robinson, and at the British Military Hospital, Fayid, the new Commanding Officer is Colonel S. W. K. Arundell, who will doubtless find the area a lot more lively than Colchester.

Correspondence

ROYAL ARMY MEDICAL COLLEGE,
MILLBANK, LONDON, S.W.1.
14*th January*, 1952.

SIR,

With reference to Major J. B. Neal's article entitled "The Directors of Medical Services in India" which appeared in the December number of the Journal, readers will doubtless be interested to know that the original portraits have been returned to Major-General D. R. Thaper, D.M.S. India, while a set of photographic copies have been sent to Major-General S. M. A. Faruki, D.M.S. Pakistan.

A further set of photographic copies have been mounted in a beautiful book, specially made and inscribed for the purpose, which will be placed in the Muniment Room of the Corps Museum at the College. Needless to say, a copy of Major Neal's excellent article will accompany the book.

I am, Sir, your obedient servant,

F. R. H. MOLLAN, *Major-General*,
Commandant.

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HEADQUARTERS (MEDICAL),
RISBOROUGH BARRACKS,
SHORNCLIFFE, KENT.
22nd January, 1952.

DEAR SIR,

I refer to the footnote of the Paper "The Reception and Training of 'Z' Reservists, 1951" which appeared in the November issue of the Corps Journal.

There are two errors, one a typist error apparently not corrected before the paper left my office, the other a printer's error.

(i) Page 357, line 36—delete "elaborate," insert "elastic."

(ii) Page 358, line 9—delete "scare," insert "score."*

With regard to (ii)—the printer's error—my comment may be regarded as rather a quibble, but I do prefer my own version of the same idea.

Yours faithfully,

R. H. ROBINSON, *Colonel*,
A.D.M.S., Home Counties District.

THE EDITOR,
JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

UNIVERSITY OF LONDON,
POSTGRADUATE MEDICAL SCHOOL OF LONDON,
DUNCANE ROAD,
LONDON, W.12.
6th January, 1952.

To: The Editor, Journal of the R.A.M.C.

SIR,

On page 227 of Volume 97 of your Journal there appeared a short article entitled "Scrub Typhus in Korea," my name being given as one of the four co-authors.

I should like to make it clear that my sole contribution to this paper consisted of providing the results of the pathological investigations quoted, and that I was in no other way concerned with the drafting of the article.

I am, Sir, your obedient servant,

K. A. G. MISSEN, B.M.

Subject: The Promotion and Maintenance of Mental Health in the Military Community.

SIR,

It is probable that, if we were still recruiting a pre-war category "A" Army, no one would disagree with Major Lewis's contentions in his letter of 21st August, 1951, that men who had a bad "civilian record" and those who deliberately show their dissatisfaction with the Service by misconduct are of no value to the Army

* Error much regretted. The Editor tries to be a proof-reader to check the professional results, but repeated readings tend to gloss over detailed words. The correct version is certainly preferable, though our version is perhaps more entertaining.—ED.

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and should be disposed of with the help of the nearest Army psychiatrist. Unfortunately, however, times have changed and we are now faced with a grave manpower shortage and, its corollary, the PULHEEMS classification. Is it not then more logical, as Captain L'Etang, in the same issue, has suggested, that psychiatric policy should have been diverted to fitting men for the fight, rather than to finding and creating posts for them at base ?

Even so some may still argue that these men would make any system of medical classification a mockery, and as it is difficult to see why they should be allowed to escape their National Service obligations, merely by making nuisances of themselves, is it not then time that the system had a sting put in its tail ? For instance, we might well take a leaf out of the Russians' notebook. They, as with the Germans during the war, found that their manpower, limitless as it seemed, was not inexhaustible, and that to maintain quantitative efficiency certain correctives such as penal battalions were necessary. This is not to propose that these men should be prescribed the suicidal tasks commonly allotted to their colleagues in the Red Army, but that we might usefully develop our usual British compromise.

Yours faithfully,
F. G. Neild, *Major*, *R.A.M.C.*,
M.R.C.S., *M.R.C.P.*, 2 *Inf. Div.*, *B.A.O.R.*

Obituary

COLONEL WILLIAM DAVENPORT CRAWLEY KELLY

On 18th December, 1951, in Wareham, Dorset, Colonel William Davenport Crawley Kelly, *D.S.O.*, late R.A.M.C., retired, elder son of the late Surgeon-General William Pierce Kelly, I.M.S. He was born 1st September, 1877, and took the M.B., Dublin, in 1901. Having served as a Civil Surgeon at the Royal Infirmary, Dublin, from January to June, 1902, he was appointed Lieutenant 1st September that year. He took up the Retired Pay appointment at Lulworth, 7th May 1934, which he held till 13th August, 1946. He served in India at Sialkot and Rawalpindi in his first tour abroad.

He served in France from 5th October, 1914, till 30th March, 1919. Twice mentioned in despatches, he was awarded the D.S.O., French Medal of Honour with silver gilt swords, French Academic Palms, the 1914 Star and Clasp, British War and Victory Medals.

After the war he served again in India in the Lahore district, of which he became A.D.M.S., and finally returned to the U.K. as A.D.M.S., Catterick.

J. G. F.

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Extract from a book by an Australian M.O.

I messed with a C.C.S. Most messes of M.Os. are interesting and varied. The Colonel was a Regular—an accessible and companionable Regular. An Irishman, he was kind of heart and quick of temper; and so able that it was never dangerous for him to allow his Captains to argue with him on questions of administration because he could always rout them: he was always right. A less able man would have taken risks in permitting argument on the subject of his administration. He was the fiercest smoker and ablest bridge player I have ever known. He used to complain of the standard of bridge played by the men in general. He put out his pipe chiefly to eat—to eat rather than to sleep. . . . He was very deaf and very fond of his dogs. . . . His officers liked him and the Sisters loved him.

LIEUTENANT-COLONEL GEORGE DEARDEN JAMESON

In the Queen Victoria Hospital, at East Grinstead, on 26th December, 1951, Lieutenant-Colonel George Dearden Jameson, R.A.M.C. Born 6th May, 1888, he took the B.A., Cantab., in 1913, and the D.P.H., England, in 1919. Appointed Temporary Lieutenant 7th August, 1914, he retired 10th July, 1940. He was an A.D. Hygiene and Pathology in India, 10th October, 1937, to 10th June, 1940, when placed on half-pay on account of ill-health. He was re-employed in the rank of Major, 24th July, 1940, and was restored to the rank of Lieutenant-Colonel on reversion to retired pay, 15th May, 1941.

He served in France from 13th August, 1914, to 1st October, 1916; on the Salonika front, 11th December, 1916, to 1st September, 1917; and with the Egyptian Expeditionary Force, including Palestine, 2nd September, 1917, to the end of the war. He received the 1914 Star, British War and Victory Medals.

J. G. F.

COLONEL WALLACE BENSON

In S. Petherton, Somerset, on 28th December, 1951, Colonel Wallace Benson, *C.B.E.*, *D.S.O.*, M.B.

Born 14th June, 1878, he took the M.B., Dublin, in 1902. Having served as a Civil Surgeon at the Curragh for a time, he was appointed Lieutenant, R.A.M.C., 31st July, 1905, and retired 14th June, 1935. He was O.C.Q.A. Military Hospital, Millbank, 1930 to 1935, and A.D.M.S., London District, for a time in 1935. He was created C.B.E. in 1935.

He rejoined 29th August, 1939, and was relegated to retired pay 18th April, 1944. During this period for a time he was again O.C. Military Hospital, Millbank, and again A.D.M.S., London District.

He was a first-class interpreter in French and a keen pianist of no mean ability.

He served on the North-West Frontier of India in 1908, being awarded the Medal with Clasp.

In 1914-1918 he served in Gallipoli, Egypt and East Africa. He was mentioned in despatches, received the Brevet of Lieutenant-Colonel, awarded the D.S.O., 1914-15 Star, British War and Victory Medals. J. G. F.

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Of Colonel Wallace Benson, *C.B.*, *D.S.O.*, Sir Matthew Fell, *K.C.B.*, writes :

Recent events in Cairo have made me think a lot about the happy time my wife and I spent from 1924 to April, 1926. I was lucky in having a very able and efficient body of R.A.M.C. officers under me at that time, and now in a very short while two have passed on—Wallace Benson, who was my D.A.D.M.S., only a fortnight ago, and in *The Times* of 29th January I see the death of Ralph Ainsworth—two good friends and two delightful English gentlemen. To Wallace Benson we owed a good deal of the very cordial relations that existed between ourselves of the military services and the British and other European members of the civil profession then resident in Cairo, both in the service of the Egyptian Government and also practising privately. In the office Wallace was always a great stickler for getting things done in the correct way and often kept me in the straight path—but the great interest and passion of his life was music. None of his friends who saw and heard him bent over the keyboard of his grand piano, with an expression of complete absorption on his face, will ever forget it. I have been somewhat too busy lately to write you a proper appreciation, but if there is any paragraph in this note that you wish to use, please do so. I only wrote Ainsworth a fortnight ago and did not know there was anything serious.

The bare official details of Colonel Wallace Benson's career are merely a background to an officer who became a legend in the Corps during his lifetime, and around whom grew stories which were difficult to sort into the true and apocryphal.

His association with the Corps was long. From Civil Surgeon at the Curragh, 1903 ; entered R.A.M.C., 1905 ; Colonel 1934 and re-employed 1939-44. He included a D.S.O. in World War I and a C.B.E. in World War II.

Perhaps Wally's chief attributes were his kindness, interest in all in the Corps, uprightness and humour coupled with his "text-book" appearance, plus a complete knowledge of all who served under him. His kindness is typified by the story of the new bugler boy who was told to knock on his door if he wanted a tube of toothpaste. Having received the boy kindly and arranging for him to obtain the toothpaste, he unerringly sent for the senior boy responsible (to lecture him on his inability to obtain his educational certificates). His interest in all who served under him could be seen when he met them in the Mess, where he invariably introduced them (however senior) as "one of my boys."

He always made a point of knowing every hospital patient and was round the wards not only by day but in the early hours. His delight was immense when a now senior R.A.M.C. officer with a detached retina patted his hand at 0200 hours in mistake for the night sister's and murmured something sounding like "Hullo, fairy feet."

His piano playing was too well known to need comment and was a background

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to his whole life; but perhaps the most typical clue to his real character was when he used the phrase, "He's the sort of man who would write an anonymous letter," for Wally himself was as honest as the day.

J. H. J. C.

The following is a tribute from some who served under Colonel Benson's command for up to eight years as Other Ranks:

The first appointment of any note to be filled by Colonel Benson was when as a Captain he was Company Commander at the Depot before World War I. There was little to indicate at that time that he was later to become one of the well-known figures in the Corps.

He will perhaps be best remembered as the first Training Officer of the Corps immediately after World War I. His work during that period had a great influence on the future training of the Corps. He laid the foundation of Corps Training and Examination which is still largely in force today. He organized many Schools of Instruction, the chief being the School of Pharmacy and the School of Massage. He was also the pioneer in obtaining recognition by civilian bodies of Corps training and qualifications.

He was largely responsible for the complete revision of the syllabus of training and examination which was included in the Standing Orders issued after World War I, the basis of which still stands today.

He was a great friend of the other ranks, and would take infinite pains in ascertaining their worries and difficulties and in personally taking action to remove them.

He was a confirmed bachelor and his main hobbies were hunting—he rode to hounds at every opportunity at those stations where this was possible; tennis—he was a first-class player, but never quite attained top honours. Finally, he was keenly interested in music. He was a talented pianist, but would not play in public or at the most minor social function. He gave a lot of time to the Corps Band, and did much to improve it during his period at the Depot. He it was who was instrumental in having the Corps March "Her bright smile haunts me still" changed to "Bonnie Nell."

He was at heart a "Corps" man and never spared himself throughout his service in doing anything to enhance its prestige.

He had a strong personality and believed only in efficiency. Of a fiery nature, at times irritable with a bark much worse than his bite, he was at heart very kind and considerate. It can safely be said of him that if he could not do anything to the advantage of a soldier he certainly would do him no harm.

At the time of his retirement in 1935 he had commanded the Q.A. Military Hospital, Millbank, for several years, and when war started in 1939 he returned to command the hospital again. In the minds of many he will always be associated with Millbank.

In every station or hospital in which he served he left his mark, and for long after his departure "Bendigo," as he was affectionately known by most other

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ranks, would often be the topic of reminiscence in messes and barrack rooms by those who had served under him.

All other ranks of the Corps who were lucky enough to come under his influence have much to thank him for, and deeply regret the passing of such an outstanding officer and gentleman.

H. M. P., A. E. W., C. E. B., R. E. H.

Memorial Service

This was held on 24th January at the Memorial Chapel, Q.A. Military Hospital, Millbank. The Service was conducted by the Rev. P. Malins. General Mollan, Commandant of the College, read the lessons. General Harris represented the Director-General, who was on tour in the Far East, and a distinguished gathering was present to honour Colonel Benson's memory.

MAJOR-GENERAL SIR RALPH BIGNELL AINSWORTH

In the Westminster Hospital on 27th January, 1952, Major-General Sir Ralph Bignell Ainsworth, *C.B.*, *D.S.O.*, *O.B.E.* Second son of the late Captain W. Ainsworth, he was born 26th September, 1875, and educated at St. Paul's School and St. George's Hospital, taking the L.R.C.P., London, and the M.R.C.S., England, in 1899. He served as a Surgeon, R.N., from February, 1900, to July, 1902, and was appointed Lieutenant, R.A.M.C., 1st September, 1902. Brevet-Colonel and K.H.P. 18th September, 1929; he retired 26th September, 1935. He was A.D.H., Eastern Command, 31st October, 1919; Assistant D.G., W.O. (temp.), 1st June, 1920, to 30th September, 1921; D.A.D.G., W.O., 1st October, 1921, to 31st July, 1924; Professor of Hygiene, R.A.M. College, 9th July, 1928, to 31st May, 1930; D.D.M.S., Scottish Command, 1st June, 1930, to 26th September, 1930; Commandant and Director of Studies, R.A.M. College, 27th September, 1930, till retirement.

He received the O.B.E., 3rd June, 1923; Officer Order of St. John, 1934; and was created C.B., 3rd June, 1935.

He was D.M.S., British Red Cross Society (Hospitals and Medical Services Department), December, 1940, to 30th June, 1947, being created Commander Order of St. John, 28th November, 1941, and knighted 1st June, 1946.

He served in France from 14th August, 1914, to 9th March, 1919, and in Russia from 24th March to 10th June, 1919.

Three times mentioned in despatches, he received the D.S.O., French Silver Medal for Epidemics, the 1914 Star, British War and Victory Medals.

J. G. F.

He married in 1903 Florence Gipsy, only daughter of the late Imre Kiralfy, Washington Square, New York. There are two daughters of the marriage.

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Lieutenant General Sir James Hartigan writes:

He was a man of great charm, invariably cheerful, possessed a very high sense of duty, and was devoted to his Corps, which he served so well. Hygiene was, of course, his special subject. I came across him most when he was D.A.D.M.S. L. of C. in the First World War and later when he was at the War Office and then Commandant of the R.A.M. College. All these appointments he held with much distinction and at the College he was ably supported by his wife on the social side. He was a devoted family man and to Lady Ainsworth and his daughters the sympathy of all his friends will go out.

MAJOR-GENERAL EDWARD GEORGE BROWNE

In the Lindens, Farnborough Park, Hants, on 17th January, 1952, Major-General Edward George Browne, *C.B.*, *C.M.G.*, late R.A.M.C., retired. Son of the late William Browne of Killymaddy, Castle Caulfield, Co. Tyrone, he was born in Killymaddy on 28th March, 1863. Having taken the L.R.C.S.I. in 1884 and the L.R.C.P.I. in 1886, he was commissioned Surgeon (afterwards Surgeon Captain) 5th February, 1887, and became a Major-General 1st June, 1918. He retired 1st June, 1922.

He took the D.P.H., R.C.P.S.I., in 1907, and was appointed Hon. Surgeon to the Viceroy of India, 1st March, 1912.

He took part in the Relief of Chitral in 1895, receiving the medal with clasp.

He served in France from 8th October, 1914, till 20th February, 1918. Five times mentioned in despatches, he was created C.B., 14th January, 1916, and C.M.G., 1st November, 1918. He was made an Officer of the Legion of Honour in 1919. He received the 1914 Star and Clasp, the British War and Victory Medals.

J. G. F.

Book Reviews

The Quiet Art: A Doctor's Anthology. Compiled by Dr. Robert Coope. Edinburgh and London: E. and S. Livingstone. 1952. Pp. ix+284. 12s. 6d.

Dr. Russell Brain, P.R.C.P., in his foreword, summarizes this book as "the quiet art of medicine illuminated by the quiet art of the anthologist." The extracts, which range from annotations in the *Lancet* and the *B.M.J.* to the Talmud and the Orthodox Liturgy, are plainly the choice of a physician who has found in his profession the fulfilment of a great part of his duty to God. Some of those who share Dr. Coope's inspiration would probably have preferred the scriptural passages in the familiar language of the Authorized Version, but many more will find in his pages a source of refreshment and comfort.

J. B. N.

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CHIROPODIAL ORTHOPÆDICS. By Franklin Charlesworth. Livingstone. Pp. vii+255. Illustrated. Price £1 5s.

This monograph describes the techniques used in the instruction of semi-permanent appliances designed to meet exactly the protective and if possible corrective requirements of each individual case of foot deformity.

Alternative techniques to obtain the positive casts of the deformity, required to ensure accurate fit, are fully described.

The methods of building up appliances suitable for the common toe and foot deformities are clearly laid out and well illustrated, and enough information is given to show how to tackle any gross deformity.

Many of the techniques could be carried out by any chiropodist ; others, e.g. surgical insoles and moccasins, while not difficult, would require considerable experience to get good results and are only practicable in a clinic organized for the work.

Each technique is dealt with separately, so that, although there is some repetition, for reference purposes the information is readily available. While this is a good technical manual for the chiropodist, any doctor or surgeon seeing much foot disability would profit by glancing through it to appreciate what can be done in a well-organized chiropody department.

J. M. M.

Extracts from the "London Gazette"

9.11.51 *Regular Army*

Maj.-Gen. K. A. M. Tomory, *C.B.*, *C.B.E.*, M.B., K.H.P. (8118), late R.A.M.C., retires on retired pay 8th November, 1951.

The undermentioned to be Maj.-Gen :

Brig. (temp. Maj.-Gen.) A. J. Beveridge, *O.B.E.*, *M.C.*, M.B., K.H.P. (8619), late R.A.M.C., 8th November, 1951.

Lt.-Col. S. W. K. Arundel (42434), from R.A.M.C., to be Colonel, 8th November, 1951.

Memoranda

Lt.-Col. W. H. Hargreaves, *O.B.E.*, F.R.C.P. (53383), is seconded under the Foreign Office, 27th September, 1951.

13.11.51 *Regular Army*

Brig. F. K. Escritt, *O.B.E.* (26278), late R.A.M.C., is appointed a Deputy-Director, Medical Services, and is granted the temp. rank of Maj.-Gen., 11th October, 1951.

16.11.51 *Regular Army*

Col. F. C. Hilton-Sergeant (26337), late R.A.M.C., to be Brig., 8th November, 1951.

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28.9.51 *Regular Army*
Maj.-Gen. (temp.) A. J. Beveridge, *O.B.E.*, *M.C.*, M.B., K.H.P. (8619), late R.A.M.C. is appointed Honorary Physician to the King, 1st May, 1951, vice Brig. H. F. Findlay, M.B. (1845), retired.
Brig. (temp.) R. J. Rosie, M.B. (27887), late R.A.M.C., is appointed Honorary Physician to the King, 25th July, 1951, vice Maj.-Gen. J. J. Magner, *C.B.*, *M.C.*, M.B. (8718), retired.

26.10.51 *Regular Army*
Col. T. H. Twigg, M.B. (1143), late R.A.M.C., retires on retired pay 29th October, 1951.

1.1.52 Maj.-Gen. J. M. Macfie, *C.B.*, *C.B.E.*, *M.C.*, M.B., K.H.S. (14140), late R.A.M.C., having attained the age for retirement is retained on the active list superny. to establishment, 13th December, 1951.
Lt.-Col. A. N. T. Meneces, *C.B.E.*, *D.S.O.*, M.D., M.R.C.P. (44406), from R.A.M.C. to be Col., 13th December, 1951.
R.A.M.C.
Maj. E. Gareh (72160) to be Lt.-Col., 13th Dec., 1951.

4.1.52 Lt.-Col. E. J. Curran, M.B. (41367), from R.A.M.C., to be Colonel, 28th December, 1951.
R.A.M.C.
Maj. J. McGhie, M.B. (75369), to be Lt.-Col., 28th December, 1951.

11.1.52 Maj.-Gen. J. M. Macfie, *C.B.*, *C.B.E.*, *M.C.*, M.B., K.H.S. (14140), late R.A.M.C., retires on ret. pay, 10th January, 1952.
Col. (temp. Brig.) R. J. Rosie, M.B., K.H.P. (27887), late R.A.M.C., to be Brig., 1st January, 1952.

Notices

BERTRAND STEWART PRIZE ESSAY COMPETITION, 1952

1. The subject for next year's competition is as follows :

"During the last war a number of unorthodox units were raised for special operations. They included Special Air Service units, the Long Range Desert Group and the Long Range Penetration Group (Wingate Expedition). Discuss the use of these small forces and the value you consider was obtained from their use. Do you consider that such forces will be useful in the future, and if so, discuss the type of operations on which you consider they might be usefully employed either in North-West Europe or in Middle Eastern territories ?"

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2. The result of this year's competition was as follows :

    Winner : Colonel M. W. Biggs, *O.B.E.*, R.E.
    Runner-up : Major R. E. S. Skelton, R.T.R.

3. The rules for the 1952 Competition were given in the July, 1951, and October, 1951, editions of *The Army Quarterly*.

Director-General of Military Training.

ROYAL SANITARY INSTITUTE PRIZE ESSAY COMPETITIONS IN 1952

The Council of the Royal Sanitary Institute have announced particulars of the prize essay open competitions for 1952. Three prizes are being offered as follows :

The Henry Saxon Snell Prize of 50 guineas for an essay on "The Selection, Utilization and Hygienic Operation of Equipment for Cleansing Utensils, Crockery, etc., in Hotels, Restaurants and Canteens."

The John Edward Worth Prize of £40 for an essay on "The Design, Construction and Fitting of Pre-fabricated Units for Cold and Hot Water Supplies and Waste Disposal in Housing Schemes."

The John S. Owens Prize of £15 for an essay on "The Ventilation of Buildings used for Industrial Processes giving rise to Noxious or Unpleasant Dusts and Fumes, and the Prevention of Atmospheric Pollution by such Dusts and Fumes."

Intending competitors should apply to the Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1, for a copy of the general conditions. Entries must be received by 31st December, 1952.

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EDITORIAL NOTICES

The Editor will be glad to receive original communications upon professional subjects, travel, personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom de plume*.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the author notifies at the time of submission that he reserves the copyright of the article to himself) become the property of the Library and Journal Committee who will exercise full copyright powers concerning such Articles.

A free issue of twelve reprints will be made to contributors of all main articles.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

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The Annual Subscription for the Journal of the Royal Army Medical Corps is £1 10s., payable in advance. Single copies, 3s. 6d. per copy.

Cheques, etc., should be made payable to the "Journal R.A.M.C.," and crossed "Glyn, Mills & Co.

Communications in regard to subscriptions, change of address, etc., should be addressed "The Manager, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

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Authors are alone responsible for the statements made and the opinions expressed in their papers.

Journal
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Royal Army Medical Corps

Original Communications

A CASE OF BILATERAL COMPLETE CERVICAL FISTULÆ

BY
D. T. H. PAINE, M.B., F.R.C.S.
Civil Surgeon Specialist,
British Military Hospital, Iserlohn.

ALTHOUGH occasional cases of unilateral incomplete or complete cervical fistulæ are seen, complete bilateral cases are distinctly rare, and I, therefore, take this opportunity to record the clinical aspects of such a case together with a few remarks on the theories on the embryology of the subject.

Case Report.—The patient, A. J. C., age 19, was complaining of a mucoid discharge from two small openings in the lower part of his neck. The discharge, which had been present from birth, was worse on exercise and continually soaked his uniform. He was very anxious to have something done about it. He said that he had never complained of swellings or inflammatory conditions in his neck and had no history of recurrent sore throats. There was no history of similar abnormalities in his family.

O/E.—It was found that there were two small openings at the lower anterior border of his sterno-mastoid muscles, one on each side. The openings had a hooded appearance and there was no scarring or sign of inflammation. A thin mucoid discharge was present. Examination of the tonsillar fossæ revealed no abnormality.

Investigation.—On 22nd September, 1951, cannulæ were inserted into each of the openings after they had been dilated with lachrymal probes, and an X-ray examination was attempted, but was unsuccessful owing to the fact tha the contrast medium did not remain in the track of the fistulæ. On the 24th, therefore, the cannulæ were reinserted, and X-ray films were taken while a solution of Pyelosil was being injected. These showed that the fistulæ were complete and opening into the mouth in the region of the tonsils. Examination of the fauces

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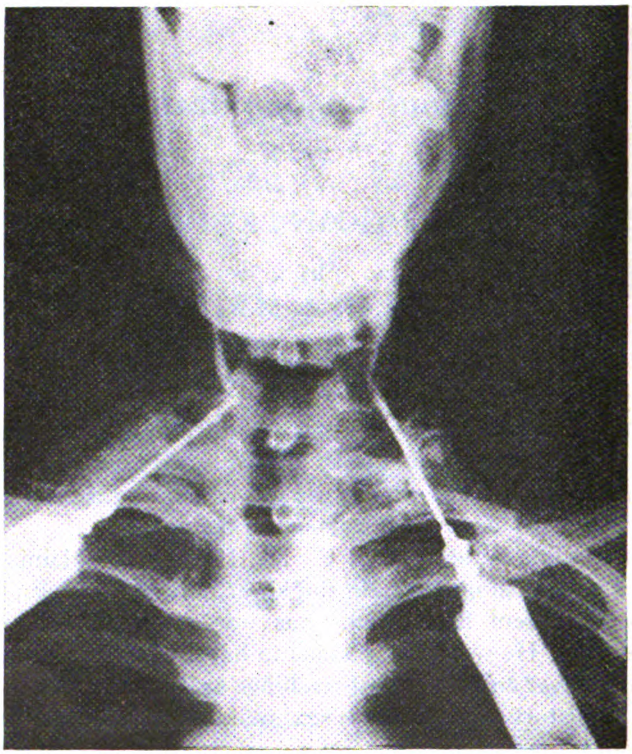
now showed that the internal openings were lying just above the upper pole of the tonsils on each side. On the 27th the patient was anæsthetized, an endotracheal tube inserted and the left fistulæ was injected with a solution of gentian violet. The fistula was then dissected out through three "step-ladder" incisions right up to the wall of the pharynx. It was found to run superficially beneath the skin from its openings to the level of the thyroid cartilage, where it pierced the deep fascia. It then passed deep to the common facial vein and between the internal and external carotid arteries to the wall of the pharynx, where it was ligated and



INJECTION TO SHOW TRACKS OF FISTULÆ

divided. The hypoglossal nerve was not seen, but was assumed to be running deep to the fistula in the condensation of deep cervical fascia, which was not dissected. The superior laryngeal nerve could be clearly seen crossing obliquely deep to the upper part of the fistula. The wounds were closed with fine silk sutures and a small rubber drain was left in the highest wound for twenty-four hours. The patient had a smooth post-operative course, and the right fistula was excised in exactly similar manner on the 4th October. Again the post-operative course was satisfactory, but with the exception that there appeared to be damage to the cervical branch of the facial nerve. Patient was discharged on 23rd October.

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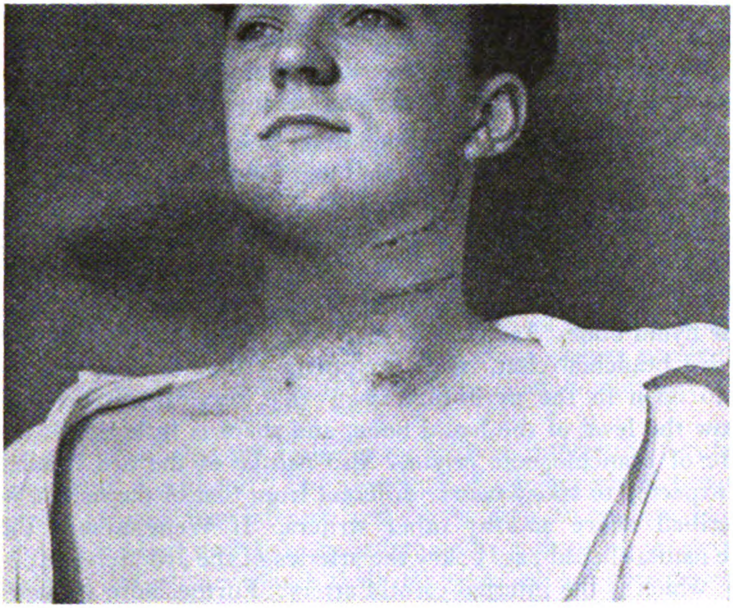
The fistulæ when examined after excision appeared to have a muscular wall enclosing them in the whole of their course, and the excision was remarkably easy through the classical "step-ladder" approach. The bifurcation of the internal carotid artery seemed to be lower than usual, and this was probably determined by the presence of the fistula. The fistulæ were examined by Major Miss M. Munro, Pathologist, B.M.H. Iserlohn, and Lieut.-Colonel D. W. Bell, Assistant Director of Pathology, Central Path. Laboratory, and a microscopical examination was reported as follows :



After First Operation, to Show Step-ladder Approach

"*Microscopic Appearance.*—Fistula lined at its upper end by columnar ciliated epithelium and inferiorly by stratified squamous epithelium ; fibrous wall infiltrated with lymphocytes. Lumen in part obstructed by amosphous debris and squames. At the upper end is some associated salivary gland tissue.

"The fistula is running through skeletal muscle rather than skeletal muscle forming part of its wall.

"Branchial fistula."

I do not agree with the last paragraph, having examined the specimens in the fresh state.

Embryology.—This subject has been exhaustively reviewed by various writers :

Hamilton Bailey, "Clinical Aspects of Branchial Fistulæ," *British Journal of Surgery*, 1933 ; **21**, 173-142 ;

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BLASSINGAME, *Annals of Otology, Rh. and Laryngology* **56**, 1947;
REYNOLDS, *Pharyngology* **56**, 1947;
EVERT, J. A., BLACK AND MARDEN, "Embryological Considerations in Surgery of the Neck": Proceedings of the Staff Meeting, Mayo Clinic, **22**, 62-66, February, 1947;
LADD, W. E., AND GROSS, "Congenital Branchiogenic Anomalies: A Report of 82 Cases," *American Journal of Surgery*, **39**, 234-8, 1938, etc.

and it is, therefore, superfluous to repeat it, but it may be stated briefly that the following theories are the most notable:

Rabl's Theory.—Rabl believed that the fistula was caused by a persistence of a second branchial cleft comparable to the remnant of the fish's gills—a simple theory against which it may be said that no breakdown in the separating membranes of the primitive branchial clefts has been observed by embryologists.

Wenglowski's Theory, 1912.—Wenglowski made a very extensive study of 75 embryos over five years and concluded that the fistulæ arose from the primordium of the thymic rudiment which arises from the 3rd branchial pouch and migrates caudally to take up its position in the anterior mediastinum. He and Meyer, 1932, in a review of Wenglowski's work, believed that the branchial apparatus could not have anything to do with embryological remnants below the level of the hyoid bone. Against this it may be objected that, if the fistulæ arise from the 3rd branchial cleft, the inner opening should, therefore, logically be expected to open in the pyriform fossa; that cervical auricles are certainly found below the level of the hyoid bone, and there is little doubt that cervical auricles are of branchiogenic origin. Also fistulæ of the 3rd branchial pouch would be expected to take a course different from that of the fistulæ which have been described above and by other writers. If Wenglowski's theory were correct the fistula should pass below the arteries of the 3rd arch (i.e., posterior in the adult), which is the internal carotid artery. Furthermore similar congenital abnormalities are not found in the region of the thymus gland. The presence of an external opening is also unaccounted for unless one believes that a communication may develop between the ductus thymico branchialis and what Norris (contributions to *Embryology*, 27, 1938) describes as the "cervical vesicles II and IV," which he said bud off from the epiderm at the bottom of the precervical sinus, and which he believed may make a contribution to the formation of the thymus gland.

Many embryologists disagree with Norris's suggestion that the cervical vesicles contribute to the formation of the thymus.

Blassingame believes that the external openings might be caused by infection and rupture of the sinuses to the skin. With this I cannot agree since the external openings were symmetrical and constant in position at the lower anterior border of the sternomastoid and with a neat unscarred orifice in the three cases I have seen, and in each case had been present from birth. The low position in the neck of the external openings could be accounted for by a differential growth of the

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skin and the underlying tissues during the embryonic stage of lengthening of the neck, and in this connection it is worth noting that the lower part of the fistula remains subcutaneous until it perforates the deep fascia at the level of the thyroid cartilage.

The Pre-cervical Sinus Theory

Most embryologists believe that these fistulæ arise from incomplete closure of the pre-cervical sinus. It will be remembered that during the development of the neck, the 2nd branchial arch enlarges and comes to overlie the 3rd and 4th arches which become buried in a hollow bounded above by the 2nd arch and below by the hypo-branchial eminence which connects the occipital region to the developing pericardium. The external opening would thereby be accounted for, and the course of a fistula which passes anterior (i.e., cephalic) to the artery of the 3rd arch, the internal carotid artery and above the hypo-glossal nerve to reach the pharynx. Its position in relation to the external carotid is not of great embryological significance, as the external carotid artery arises as an offshoot from the artery of the 3rd arch and could, therefore, pass to either side of the fistula. This theory, however, does not account for the position of the internal opening or indeed the presence of an internal opening. To explain the internal opening it has been suggested again that infection and rupture occurs at the weakest part of the pharyngeal wall in the region of the tonsils. This is not a very attractive theory, as a history of infection is not always present and the lining of the fistulæ in the case described above was ciliated columnar epithelium in their upper parts.

It is clear, therefore, that the embryology of these interesting fistulæ has not yet been completely elucidated. The presence of salivary gland tissues in the case described is of particular interest, and I have seen no reference to it in the literature. It is at present useless to speculate on its embryological derivation as the embryology of the salivary glands themselves has not yet been finally settled.

I am indebted to Lieut.-Colonel W. F. L. Fava for permission to publish this case and for his help in preparation of the X-ray films and photographs.

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CHEST ABNORMALITIES DETECTED BY MASS MINIATURE RADIOGRAPHY

A REPORT ON THE SIGNIFICANT CLINICAL ABNORMALITIES FOUND BY ONE ARMY CENTRE DURING TWELVE MONTHS

BY

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METHOD AND MATERIAL

THIS report is based on the clinical abnormalities detected during one year at a clinic of the Cambridge Military Hospital, Aldershot, dealing with abnormalities found on Mass Miniature Radiography (M.M.R.). The clinic is organized on the basis of consultation between the radiologist (Major J. S. Webster, *O.B.E.*, R.A.M.C.) and myself, followed by clinical assessment.

The patients concerned are drawn from local units, the majority being eighteen-year-old National Service men. These men have a miniature film taken by the Mobile No. 6 M.M.R. Team during their first few weeks' service. The films are read by the radiologist. Men with abnormal films then attend the hospital for 15 × 12 in. posterior-anterior plates, and other views or screening as may be considered necessary. The wet film is immediately examined by the radiologist and clinician. Patients with confirmed abnormalities undergo a full clinical examination, either as out- or in-patients, ancillary investigations being performed as required. There is, unfortunately, a time lapse between the initial M.M.R. and a man's attendance for full size film, during which period some of the men leave the area. The documents of such cases are forwarded to the new unit and the man referred to the nearest Military Hospital. Conversely, patients are seen for follow-up, having been filmed by other M.M.R. Teams. The documentation adopted is such that, owing to this factor, the exact number of men at risk cannot be stated, but the number of men gained and lost to the clinic approximate.

Using the figure of patients at risk as 44,868, the number X-rayed by the No. 6 M.M.R. Team during the twelve months under review, it is found that the approximate incidence of abnormalities is lower than that noted by other authors dealing with service personnel (Brooks, 1944; Trail, 1942; and Trail *et al.*, 1944). Possible factors influencing this are the recent employment of M.M.R. at some pre-service medical examination centres, with consequent exclusion from the forces of men with chest lesions apparent radiologically, and the lower

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average age of the patients at risk in the present series. Of those showing abnormalities, 86.7 per cent. were in the age group 17 to 20, and no patient was over 35 years of age (Table I).

Findings

The abnormal findings of the clinic during the twelve months 1st March, 1950, to 28th February, 1951, are summarized in Table II, this being a composite table of significant clinical and radiological diagnosis.

Table I.—Age Groups of Patients with Abnormalities

Age Group	17 to 20	21 to 25	26 to 30	31 to 35	Total
Number	150	18	1	4	173
Percentage of total abnormal patients	86.7%	10.4%	0.6%	2.3%	

Table II.—Summary of Findings

Tuberculous Lesions	
Active pulmonary tuberculosis	20
Possibly active pulmonary tuberculosis	16
Inactive pulmonary tuberculosis	54
Large calcified mediastinal lymph glands	5
Non-Tuberculosis Respiratory Lesions	
Pleural thickening following "idiopathic" effusion or of unknown aetiology	10
"Idiopathic" pleural effusion	2
Pleural thickening and/or pulmonary fibrosis with a history of pneumonia or empyema	13
Proven bronchiectasis	11
Bronchiectasis suspected on plain X-rays but not confirmed	17
"Pneumonitis"	11
Lobar pneumonia	2
Emphysema with chronic bronchitis	3
Congenital atelectasis of right lung	1
Eventration of the diaphragm	2
Cardiovascular Lesions	
Atrial septal defect	1
Cardiomegaly with no apparent cause	1
Gross displacement of the heart to the right	3
Pulmonary arterio-venous fistula	1
Total	173

Tuberculous lesions	95
Non-tuberculous respiratory lesions ...	72
Cardiovascular lesions	6

Approximate number at risk—44,868.

In addition, many patients with minimal radiological findings, such as minute calcified foci, or slight increase in lung markings with no apparent clinical cause, have been excluded from this series. Such lesions have little or no significance for the patient or to his military efficiency. Skeletal abnormalities have been referred directly to the Orthopædic Department, and are not included.

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The findings have been classified as tuberculous, non-tuberculous, and cardiovascular, the first group being subdivided into active, "possibly active," and inactive lesions.

Men with active tuberculosis were transferred to the Army Sanatorium on diagnosis, thus avoiding further contact with men at their unit or in the general wards of the hospital. In many cases this was done on the clinical and radiological features alone, and before examination of the sputum could be undertaken. The "possibly active" group were likewise transferred, after preliminary investigation and observation. Temperature recordings at rest and during normal

TABLE III.—SUMMARY OF FINDINGS IN PATIENTS WITH BRONCHIECTASIS
(All patients had sputa examined on at least three occasions for the tubercle bacillus with negative results)

		Symptoms						Signs and Investigations		
Patient	Age	Productive Cough	Hæmoptysis	Exertional Dyspnœa	Pleurisy in the past	Duration of Symptoms	Previous Pneumonia	Basal Râles	E.S.R. (Westergren) mm. in 1 hr.	Bronchogram
636	18	+	0	+	+	Life	+	+	20	—
478	18	+	0	0	0	16 years	0	+	17	Showed bronchiectasis
347	18	+	0	±	0	4 years	+	+	—	—
741	18	+	0	+	0	13 years	+	+	—	—
750	18	+	0	0	0	6 years	0	+	9	Showed bronchiectasis
519	18	+	0	±	0	11 years	+	+	—	—
613	19	+	0	+	0	1 year	+	+	24	Showed bronchiectasis
206	19	+	0	±	0	3 years	+	+	35	Showed bronchiectasis
457	18	+	0	+	0	2 years	+	+	1	Showed bronchiectasis
549	18	+	0	+	0	10 years	+	+	—	Showed bronchiectasis
887	18	+	+	+	+	4 years	+	+	14	Showed bronchiectasis

activity, the patient's weight, erythrocyte sedimentation rate, and repeated examination of the sputum for the tubercle bacillus were performed in the assessment of these men. The final diagnosis is not known in these cases, but it is probable that some were subsequently considered to be inactive, and should correctly come in the inactive tuberculosis group. The diagnosis of inactivity was made after full investigation, the patients being dealt with entirely at the hospital, either as out- or in-patients. Arrangements for follow-up clinical and radiological examinations were made for such men during the period of their service.

Large mediastinal glands in five cases all showed some calcification, evidence of a previous tuberculous infection. The glands in these cases showed marked enlargement and these men have been differentiated on this account from a

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number of patients showing small calcified glands on X-ray, the healed residue of a Ghon's focus.

The assessment of non-tuberculous conditions has been made more readily at the clinic, as transfer on the grounds of infectivity was not required. Prolonged observation, a difficult procedure in service medicine, is not necessary in most cases before making a diagnosis.

Pleural thickening of unknown ætiology has been grouped as non-tuberculous, though in some patients it may well have a tuberculous basis, and in two cases was associated with a small calcified focus in the lung.

TABLE IV.—SUMMARY OF FINDINGS IN PATIENTS WITH RADIOLOGICAL CHANGES SUGGESTIVE OF BRONCHIECTASIS IN WHOM THE CLINICAL FEATURES OR A BRONCHOGRAM DID NOT ALLOW OF THIS DIAGNOSIS. REPEATED EXAMINATIONS OF SPUTA, WHEN AVAILABLE, WERE NEGATIVE IN ALL THESE PATIENTS

Patient	Age	Productive Cough	Non-productive Cough	Hæmo-ptysis	Dyspnœa	Pain	Duration of Symptoms	Previous Pneumonia	Persistent Basal Râles	Signs of Generalized Bronchitis	E.S.R. (Wester-gren) mm/hour	Broncho-gram
325	18	+	–	0	0	0	6 years	0	0	0	1	Normal
286	18	0	0	0	0	0	—	0	0	0	12	—
969	18	0	0	0	0	0	—	0	0	0	—	—
480	18	0	0	0	0	0	—	0	0	0	—	—
738	18	0	0	0	0	0	—	0	0	0	—	—
320	18	–	+	0	0	0	1 mth.	0	0	+	—	Normal
844	18	+	–	0	+	±	Life	+	+	+	5	Normal
297	18	–	+	0	0	0	1 year	0	0	0	—	—
047	18	Slight	–	0	0	0	3 years	0	0	0	3	—
958	18	Slight	–	0	0	0	—	0	0	0	7	Normal
330	18	+	–	0	0	0	2 years	0	0	+	5	Normal
590*	18	–	+	0	0	0	Life	–	0	0	4	—
511	21	+	–	0	±	0	Life	0	+	+	4	Normal
117	18	+	–	0	+	0	6 years	+	±	0	7	Normal
424	18	+	–	0	+	+	Life	0	0	+	1	Normal
311	18	0	0	0	0	0	—	0	0	0	—	—
161	19	+	–	0	+	0	Life	0	0	+	6	Normal

* This patient had marked halitosis.

Bronchiectasis was diagnosed clinically in four cases and confirmed by bronchogram in seven further patients (Table III). All these cases had cough and sputum of over one year's duration, and all except two (both proven by bronchogram) gave a history of pneumonia in the past. Radiologically there was little distinction between the group of proven bronchiectasis and those in whom the clinical features or bronchogram did not allow of this diagnosis (Table IV).

Radiological changes suggestive of bronchiectasis, and in many cases as marked as in the bronchiectatic group, were found in seventeen cases. Eight of these men had little or no cough, and further examination was not undertaken. Nine patients complained of a chronic productive cough, but bronchogram was negative. A history of past pneumonia was given by two men in this group, both of whom had physical findings suggestive of mild bronchiectasis. I feel that an

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element of "microscopic" bronchiectasis, not apparent on a bronchogram, may have been present in these patients. Brónchiectasis sicca has not been excluded in the eight symptomless cases.

Chronic bronchitis and emphysema was diagnosed in three cases on the clinical and radiological findings. One of these patients had a localized emphysema of the left apex, both clinically and radiologically, together with signs suggestive of basal bronchiectasis ; a bronchogram was, however, negative.

Residual pulmonary fibrosis or pleural thickening, the end result of known pneumonia, with or without empyema, forms a numerically large group. These patients had little or no cough, or other symptoms of pulmonary disease, and the only signs were those of the pleural thickening or pulmonary fibrosis.

Acute chest conditions have been found in fifteen patients, two with pleural effusions confirmed by aspiration, two with true lobar pneumonia, and eleven with pneumonitis. This condition is a definite entity, the usual complaint being that of a fairly severe attack of coryza which "settled on the chest." The symptoms are slight, being those of mild pyrexia and upper respiratory catarrh, and in no case had the patient failed to continue with his normal duties. I consider the ætiology of this change was a low-grade localized bacterial pneumonia which appeared radiologically as an area of consolidation or collapse. Even in fairly extensive cases bronchial breathing was absent, though râles were found in all such patients. Laboratory findings showed a normal or slightly increased white blood count. Sputa were negative for the tubercle bacillus and showed the normal oral flora. Four cases were examined for cold agglutinins with negative result. Eight of these cases occurred during the period January and February, 1951, during an influenza epidemic, but virus studies were not performed. Serial X-rays were continued until complete resolution obtained in all these patients. The erythrocyte sedimentation rate was also followed until it was normal.

Cardiovascular disease of significant degree is unusual, presumably due to exclusion by previous medical examinations. One case each of atrial septal defect and cardiomegaly of unknown ætiology were found, as was a single pulmonary arteriovenous fistula (Nightingale, 1951).

In three cases the heart was displaced to the right though of normal contour. No cause was found in two cases ; the third may have been due to partial pulmonary collapse during pneumonia in childhood.

Eventration of the L. arch of the diaphragm was found twice and a symptomless total atelectasis of the R. lung on one occasion. This latter patient had been a 3½ lb. premature baby, and the R. chest had always shown poor development.

Conclusion

These findings, though not numerically large, demonstrate the value of using Mass Miniature Radiography at the time of a man's enlistment into the Army or, ideally, prior to his call up. The detection of tuberculosis is the major purpose of M.M.R. and the diagnosis of activity is of importance both to the patient and to

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his barrack-room comrades. Follow up of apparently healed cases will lead to early diagnosis of reactivation.

Detection of bronchiectasis is important for service personnel. Barrack-room conditions tend to lead to a higher incidence of upper respiratory infection, and deterioration of a bronchiectatic condition is common in service men.

The time taken by the original M.M.R. is short, and if this is found to be normal, no interruption of a man's training is required.

Bradbury (1948) discusses the diagnostic value of Mass Miniature Radiography in relation to the number X-rayed, compared with the number of like subjects with similar risks who avoid the survey. In a group such as this 100 per cent. attendance is obtained, an ideal unlikely in any civilian survey.

The cost of routine M.M.R. has been considered by Hoffstedt (1950). X-ray of the chest is desirable in all service entrants and Mass Miniature Radiography provides an efficient, cheap method of doing this.

This report indicates the value of such a survey on service men, in the detection of pulmonary disease.

Summary

The methods adopted by a clinic in assessing patients found to have abnormalities on the routine Mass Miniature Radiography of soldiers are described.

These findings are discussed and classified.

The value of M.M.R. at the time of a man's enlistment is considered, and it would appear to be a satisfactory method of detecting pulmonary disease not readily apparent to routine clinical examination.

I am indebted to Major J. S. Webster, *O.B.E.*, R.A.M.C., for the initial interpretation of the M.M.R. films and further plates, and to his staff for their help. I would like to thank my colleagues for help with the survey, and also to thank Colonel V. C. Verbi, *O.B.E.*, Officer Commanding, Cambridge Military Hospital, Aldershot, for permission to publish these findings.

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TWO CASES OF FAT EMBOLISM

BY

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THESE two following cases of fat embolism are reported for the following reasons :

(1) They both occurred within the space of one month.

(2) The second case shows fat embolism out of all proportion to the magnitude of the bony structures involved.

CASE NO. 1

Pte. G., a healthy young paratrooper aged 29 years, sustained a subtrochanteric fracture of his right femur whilst parachuting at night. He was taken immediately to hospital where, under general anæsthesia, his leg was immobilized by skin traction on Thomas splint. The following morning his condition was most satisfactory and he showed no signs of shock and was fully conscious and comfortable. It was arranged for him to be transferred to the Cambridge Hospital that afternoon. Fifteen hours following the injury his transfer was made. He was given ¼ grain morphine. The journey was thirty miles and was made by ambulance, taking two hours.

On arriving at his destination he was drowsy and had pin-point pupils. It was thought at this time this was due to morphine. Two hours later (eighteen hours after injury) he showed signs of cerebral irritation coupled with cyanosis. Following X-rays of skull and lumbar puncture (negative results) the diagnosis of fat embolism was made. He was given continuous oxygen through B.L.B. mask and penicillin. Twenty hours following injury his condition worsened and he was in deep coma, no focal CNS signs ; râles at bases of lungs. Temperature 99° ; pulse 130, regular ; respiration normal. Thirty-four hours following injury his condition suddenly deteriorated again. He had gradually developed a pyrexia of 103°. His pulse became irregular and he developed signs of circulatory collapse. Death took place at forty-eight hours after injury.

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Autopsy Findings

The body is that of a well-developed, well-nourished, young adult male, measuring 69 inches in length and weighing approximately 160 pounds. Full rigor is present in the jaw, upper and lower limbs. There is a slight abrasion in the skin overlying the bridge of the nose. The left pupil measures 5.5 mm.; the right one measures 6.0 mm. in diameter. The right lower limb is in external rotation, and is markedly crepitant to movement. The girth of the right thigh at its midpoint is considerably increased, and the lateral aspect shows a sizeable dark blue discoloration.

Each pleural space contains approximately 150 ml. of serosanguinous fluid. The abdomen is free of adhesions and of extraneous fluid.

Cardiovascular System

Heart.—The heart shows a scant number of epicardial petechial hæmorrhages, posteriorly at the atrio-ventricular groove.

Aorta.—The aorta shows a few atheromatous plaques throughout.

Respiratory System

Lungs.—The left lung weighs 818 gm. The surface is smooth and shiny throughout, and shows many disseminated petechial hæmorrhages. The entire lower lobe is liver-like in consistency, dark purple, and non-crepitant to digital compression. The upper lobe shows small foci of atelectasis, but it is otherwise normally crepitant. On section, the free edge of the lower lobe everts, and copious serosanguinous fluid runs from the free uniformly dark purple surface.

There are no grossly demonstrable emboli.

The right lung weighs 908 gm. It resembles its fellow in all respects, except that the involvement extends into the upper lobe to a moderate degree.

Hematopoietic System

Spleen.—The spleen is not remarkable.

Lymph Nodes.—The lymph nodes are not remarkable.

Gastrointestinal System

The gastro-intestinal tract is examined from the level of the epiglottis to the anus. It is not remarkable except for many mucosal petechial hæmorrhages in the sigmoid colon.

Liver.—The liver weighs 1,800 gm. It is dark brown, and on section displays a slight nutmeg pattern.

Central Nervous System

Brain.—There are no abnormalities in either the scalp or calvarium. The dura is pearly-grey, and tense. The brain is markedly hyperæmic and the gyri are flattened. A marked pressure conus is noted in the inferior surface of the cerebellum. Further microscopic examination of the brain reveals nothing worthy of note.

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Miscellaneous

Right Lower Limb.—The right thigh at its midpoint measures 24.5 inches in circumference ; the left thigh at the same level measures 20.5 inches in circumference. On dissection of this region of the right thigh, the femur is found to be involved in a comminuted fracture, the ends of the bone overriding for a distance of approximately 3 inches. The adjacent muscle is disrupted by massive hæmorrhage, and torn by the sharp bone ends.

Microscopic Examination

Heart.—A fresh sub-epicardial hæmorrhage is noted. The nuclei in the myocardium vary considerably in size and in staining quality. There are rare small foci of myocardial coagulation necrosis. There is no cellular inflammatory exudate.

Lung.—One section displays well-aerated lung, showing congestion of the vasculature, minute focal recent hæmorrhages, and a diffuse, very light, intra-alveolar cellular infiltrate comprised of macrophages, an occasional neutrophile, and a rare eosinophile.

Another section shows large focal patches of cellular consolidation, generalized vascular congestion, and frequent focal recent hæmorrhages. In the more darkly-staining areas the cells are principally neutrophiles, and an occasional macrophage. In the more lightly-stained cellular zones the infiltrate is either a sparse number of neutrophiles in a protein precipitate or the infiltrate is phagocytic, with many of these showing clear cytoplasmic vacuoles.

A third section displays the same picture as seen in the second slide, except that the entire lung is consolidated.

The bronchi and bronchioles are filled with neutrophiles. The epithelium is desquamated and the structure is identified only by the muscle in the wall.

Tracheobronchial Lymph Node.—The node shows generalized vascular engorgement. The sinusoids are filled with macrophages, lymphocytes, eosinophiles, and a few neutrophiles. Many of the phagocytes show a foamy cytoplasm ; some show large, solitary, clear vacuoles. In the medullary portion of the node there is considerable anthracotic deposit.

Colon.—The colon shows vascular congestion and severe œdema of the lamina propria.

Liver.—The liver shows a severe centralobular passive congestion.

Spleen.—The spleen shows generalized, severe passive congestion. It is not otherwise remarkable.

Thyroid.—The thyroid gland shows acini lined by a low epithelium, and filled with a deeply-stained colloid.

Fat Stain Report

Prostate.—Definite fat embolism.

Trachea.—Definite fat embolism.

Suprarenal.—Copious lipoid, but not definite fat embolism seen.

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Brain.—A small area of recent softening shows diffuse positive Sudan III staining, suggesting a leakage of embolic fat from a ruptured vessel.

Spinal Cord.—Fat embolism not seen.

Thyroid.—Definite fat embolism.

Spleen.—Abundant fat in splenic sinusoids, with an occasional globule in a vessel.

Kidney.—Fat in vessels, glomerular tufts, tubular epithelium and limina of tubules.

Stomach.—Abundant fat irregularly distributed throughout sections.

Lung.—Copious fat in vessels and alveoli.

Myocardium.—Some diffuse lipoid staining, but no true embolic fat seen.

It was not possible to frame any suspicion of fat from the H. and E. sections.

Discussion

The positive findings in this case include :

1. Fractured (simple comminuted) right femur.
2. Cerebral congestion and œdema, moderately severe.
3. Bilateral mild pleural effusion.
4. Bilateral pulmonary œdema, severe.
5. Bilateral pulmonary congestion, severe.
6. Petechial hæmorrhages, pulmonary, diffuse.
7. Tracheobronchitis, mucous, moderately severe.
8. Petechial hæmorrhages, heart and sigmoid colon, mild.
9. Widespread fat embolism (trachea, lungs, thyroid, spleen, kidneys, stomach, prostate).

Comments

The immediate cause of death in this case must rest with severe pulmonary embarrassment due to massive pulmonary fat embolism, œdema and congestion. The pulmonic lesions led to anoxia of all organs, but to the most serious detriment of the cerebral centres. The fat emboli no doubt were instrumental in causing rightsided cardiac failure manifested by widespread passive congestion of viscera. The brain, of course, showed the effect of this, in the œdema and hyperæmia found therein. The latter in effect compounded the cerebral anoxic sequelæ and no doubt aided failure of cardio-respiratory and thermic centres.

Cause of Death

1. Anoxia, severe, secondary to acute focal pneumonitis, œdema, and congestion caused by fat embolism.

2. Simple complete fracture, right femur.

Case No. 2

Pte. R., a healthy young soldier aged 22 years, was on an assault course. He was crossing a river by a rope-walk and he fell. As he fell some ten feet he landed in shallow water and a thunderflash exploded under his right foot. He was not concussed. The explosion blew the toe of boot away and damaged the

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right foot. Half an hour later he was given a ¼ grain of morphine and removed by ambulance to hospital. He arrived at the hospital three-quarters of an hour after the injury was incurred. On admission a tourniquet (applied immediately following the injury) was found to be only causing venous congestion and was removed. It was found that he had sustained compound fractures and partial amputation of all his toes of his right foot and he had simple fractures of the metatarsals III and IV. His condition was one of a slight degree of shock, but he was quite lucid and gave a clear account of the accident. He was immediately given A.T.S. and started on penicillin therapy.

Five hours following accident his condition had improved and it was decided to take him to the theatre for wound inspection and treatment; he was given atropine 1/100 grain. A half an hour later, before he had left the ward, he became drowsy, and within a period of ten minutes became fully unconscious. He was slightly cyanosed, pulse regular and normal (72), B.P. 150/90; chest, abdomen and CNS were NAD. X-ray of skull and lumbar puncture proved normal, and a diagnosis of fat embolism was made. Continuous oxygen therapy (B.L.B. mask) was started. His condition gradually worsened and seven hours following injury he gradually developed a pyrexia (101°). Blood sugar level was 200 mgms. per cent.

Next day (twenty-two hours following injury) he was still in deep coma and his respirations had become stertorous. Numerous râles could be seen in both lungs. Temperature was now 102° and B.P. 155/95. He had pin-point pupils not reacting to light. No other focal signs in his CNS. Blood sugar level was now 130 mgms. Urine (catheter specimen) was examined, but no lipuria could be demonstrated. Twenty-three hours following injury he had an attack of Jacksonian epilepsy, commencing on the right side of his face and spreading to the right arm and leg. Small petechiæ appeared on the chest wall. His condition gradually worsened and the patient died thirty-one hours following injury.

Autopsy Findings

The body is that of a well-developed, well-nourished white male. Dependent lividity is marked and post-mortem rigidity is complete throughout. Occasional petechial hæmorrhages are noted over the face, chest and thighs. The nail beds display deep cyanosis. Several small abrasions are noted over the right thigh and leg. There is rather deep excoriation over the heel and instep of the right foot. Each toe of the right foot is involved in a ragged wound in which the soft tissues and splintered bone are visible.

Head.—Except for the previous mentioned petechial hæmorrhages, the external examination of the head is not noteworthy. The examination of the brain displays moderate vascular congestion and a small linear subarachnoid hæmorrhage over the right post-central gyrus. There is no flattening of the gtyri and a pressure cone is absent. Numerous coronal sections of the brain, brain stem, and cerebellum fail to show noteworthy findings. There are no apparent skull fractures.

Thorax.—There is a small amount of clear amber fluid in each pleural space.

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Left Lung.—The left lung is smooth, shiny and generally of a gun-metal hue. Occasional clustered petechial hæmorrhages are scattered over the surface. The lung is heavy and boggy, though some crepitus is appreciated upon digital compression. While the lung in general is filled out and somewhat tense, there are occasional focal, small, dark blue depressed areas suggesting atelectasis.

On section the lung appears wet and a moderate amount of serosanguinous fluid issues freely from the out surface. When viewed in obliquely reflected light, minute fat globules are seen to float upon this fluid. The tracheobronchial tree and pulmonary vasculature are not remarkable.

Right Lung.—The right lung resembles its fellow in all respects.

Other organs appear normal.

Microscopic Appearance

Lung.—The vasculature is generally engorged with blood, and the alveolar capillaries often display small clear spaces, later identified as fat. The lung shows focal consolidation *not* always related to bronchioles. The consolidation is comprised of a varying admixture of protein-precipitated fluid, masses of neutrophiles and frequent masses of bacteria. There is a generalized light sprinkling of macrophages in the alveoli. Often these contain dark granular pigment, presumably anthracotic.

There are also foci of anthracosis-filled macrophages enmeshed by variously dense fibrous tissue accumulation.

Tracheobronchial Lymph Node.—The lymph node architecture is largely replaced by a faintly acidophilic structureless material ringed thinly by fibrous tissue. Just inside the fibrous tissue rim one sees occasional giant cells. The node otherwise shows intense vascular engorgement.

Heart.—The myocardium shows small focal degeneration attended by a neutrophilic cellular infiltrate.

A recent perivascular hæmorrhage is seen in the epicardial fat.

Liver.—The liver shows centrilobular vascular congestion.

Most other organs show slight congestion.

Fat Stain Report

Lung.—The lung shows considerable intra-alveolar and intravascular fat distributed focally.

Trachea.—Some intravascular and perivascular fat is seen in the tracheal adventitia.

Heart.—The heart shows focal fatty deposits in the myocardial fibres.

Liver.—Fat is seen within the centrilobular hepatic cells.

Adrenal.—Massive intracellular fat is seen in the adrenal cortical cells.

Kidney.—Fat is seen in the glomeruli and apparently within the lumen and cells of the proximal convoluted tubules.

Spleen.—The spleen shows no fat.

Brain and Brain Stem.—The brain and brain stem sections reveal no fat, nor is any abnormality found by H. and E. staining.

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Significant findings in this case include the following:

1. Compound fractures and partial traumatic amputation of *all* toes, right foot.
2. Widespread traumatic excoriation of the skin (heel and instep), right foot.
3. Traumatic widely scattered small abrasions, right leg.
4. Petechial hæmorrhages of face, chest, thighs, lungs, epicardium and pericardium.
5. Hydrothorax, mild, bilateral.
6. Passive congestion, moderately severe, pulmonary.
7. Pneumonitis, focal, acute.
8. Fat embolism, massive pulmonary.
9. Myocardial degeneration, acute, focal.
10. Passive congestion, acute, liver.
11. Fat embolism, glomerular tufts, kidney.

Comments

This is the case of a young male who died of widespread fat embolism following compound fracture of all toes of the right foot. Actual fat embolism is demonstrated in many organs—mostly importantly in lungs and kidneys. In the former, a severe inflammatory reaction attends the fat deposit. In the kidney, the fat evokes no inflammatory response: the renal consequence would seemingly impose a pure mechanical blockage of glomerular loops. In connection with the patient's coma, the normal macroscopic, microscopic and fat-staining appearances are interesting.

It is suggested that a considerable quantity (American Archives of Pathology—150 gm.) must enter the circulation for death to follow upon such an embolic phenomenon. In a case as this, the question arises as to the source of such a large quantity of fat. Certainly such a large amount did not arise in the marrow of the fractured phalanges; and it is difficult to see how it would gain access to the circulatory tree from the surrounding soft tissue. One is led to wonder if the fat might not arise at the site of injury, therefore, but that the injury sets off a metabolic derangement whereby fat from more distant body sources is in some way set free and allowed to enter the circulation.

The fat in myocardial fibres and in liver cells is thought to be fatty degeneration—on an anoxic basis. That in myocardium secondary to fat embolism; that in liver cells perhaps related to the passive congestion noted therein.

Cause of Death

1. Anoxia, severe, secondary to widespread fat embolism (particularly pulmonary).
2. Traumatic compound fractures, all toes, right foot.

Our thanks are due to Major-General T. Menzies, *C.B.*, *O.B.E.*, M.B., K.H.P., D.D.M.S., Southern Command, for permission to publish these cases, and to Major J. Neal, R.A.M.C., for help in confirming our fat-staining findings.

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

BY

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[*Continued from page* 197, *March issue*]

PART THREE

Summary and Conclusions

Summary

A study of 24 Egyptian male foodhandlers who were passing enteric group organisms in their urine has been made and certain control tests have been carried out. Findings were as follows :

Classification

Urinary excretors of enteric group organisms may be classified as :

Chronic persistent carriers.
Chronic intermittent carriers.
Transient carriers.

Incidence

Ten of the first group were studied. The incidence of chronic persistent carriers among the population from which they were derived appears to be between 0.16 and 0.5 per cent. The incidence of the two other groups must remain a matter of speculation owing to the high element of chance in their detection. It may lie in the range between 0.13 and 0.65 per cent. for chronic intermittent carriers. A total carrier incidence of 1 to 3 per cent. is suggested.

Regularity of Excretion

Chronic persistent carriers pass organism very regularly in their urine. 382 (93 per cent.) of 411 specimens examined by culture were positive. Specimens per individual ranged from 11 to 73 and positives among them from 66 per cent. of 29 to 100 per cent. of 56. The highest number of consecutive negatives

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was three. Two or more consecutive negatives by all methods used were only observed four times, though occurring eight times among direct plate cultures.

Only one of the chronic intermittent carriers studied showed a high proportion of positive culture—52 (66 per cent.) of 78 carried out. Others yielded infrequent positive cultures.

Numbers Passed

The numbers of organisms present in the urine of chronic persistent carriers ranged from a few (one colony on plating a loop of the specimen) to 30,000,000 per ml. Of 35 viable counts made on the ten chronic carriers, 18 (from six of them) gave a figure of over a million per ml. The lowest viable count was 700 per ml.

Schistosomiasis

There is a high and probably significant positive correlation between the chronic urinary carriage of enteric group organisms and urinary schistosomiasis. Eight of the ten persistent carriers studied showed the presence of ova of *S. hæmatobium* in their urine, seven of them on first examinations; 82 (45.3 per cent.) of 181 examinations on *all* persistent chronic carriers were positive. Three intermittent chronic carriers yielded 24 (29.3 per cent.) positive specimens —none of these were first examination specimens. The number of positive first examinations on 676 foodhandlers was 89 (13.2 per cent.); from this an incidence of 29 per cent. in the unselected population was inferred. A sample of a similar population showed an incidence of 40 per cent. on repeated examination. Of the examinations on the last group, 17.9 per cent. in all, and 47 per cent. of those from the proven schistosomiasis cases, were positive.

Urinary Antibodies

Antibodies to the flagellar antigen of the infecting species were generally found at a titre of 1/2 or over in the urine of chronic persistent carriers who had been inoculated against enteric. They were also commonly noted when 1/4 was the lowest dilution tested, the comparative figures for ten carriers being 84/100 (84 per cent.) examinations positive on testing at 1/2 dilution, and 86/166 (52 per cent.) at 1/4 dilution. Eight consecutive negative tests were, however, observed when the 1/2 dilution was omitted, while only three consecutive negative tests were noted when the test was carried out at this dilution. Antibodies to other enteric species were much less frequently noted and were generally of lower titre. Titres of both homologous and heterologous urinary antibodies were compared with serum titre to the same antigens. Antibodies were also found in the urine of chronic intermittent carriers. They were generally of low titre only, but when the test was carried out in dilutions rising from 1/2 they were more often found than were organisms during periods when passage of the latter was infrequent.

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Urinary antibodies were observed in 6.1 per cent. of the control population. There was a positive correlation between their presence and that of schistosoma ova. Their possible source is discussed.

Three carriers were detected, though routine cultures were negative, by extra cultures undertaken because urinary antibodies were present.

Conclusions

The high incidence of chronic urinary carriage of enteric organisms among male Egyptian foodhandlers is due to a high rate of infection in a population largely infested with *Schistosoma hæmatobium*. Schistosomiasis probably causes chronicity, perhaps by providing vesical foci for local invasion by the organism.

Chronic persistent carriers can generally be detected by simple culture of a single specimen. If two specimens are examined the chance of such carriers evading detection is very small.

Intermittent carriers cannot be detected with certainty by the culture of any number of specimens which it is practicable to examine in routine work. Our results suggest that, while culture of three specimens might lead to the discovery of 20 to 80 per cent. of chronic intermittent carriers, over 40 per cent. might escape detection even were eight culture tests made. Such infrequent excretors, however, present a relatively small risk. Transient carriers can only be detected by chance.

Urinary antibody excretion is also associated with schistosomiasis. The antibodies are present in the blood passed in the urine, but may perhaps also be locally produced in the lesions.

The demonstration of antibodies in urine may be of value in carrier detection:

(*a*) As an additional method to culture. This affords little or no advantage in the detection of persistent carriers, but the chance of detecting intermittent carriers is enhanced if more intensive investigation is made when antibodies are found in culture-negative urine.

(*b*) As a screening test to limit the number of specimens which need be sent from a distance to a fully equipped laboratory. If specimens for culture are restricted to those from persons who have passed urinary antibodies on one or more of three occasions it is unlikely that a persistent carrier will be missed, and, with more intensive follow-up as above, the chance of detecting an intermittent carrier should not be less than were three specimens cultured primarily.

(*c*) As the sole test for exclusion from employment in isolated localities from which transmission of specimens to a laboratory presents difficulty. If all who pass urinary antibodies on one or more of three occasions are excluded from employment as foodhandlers, about 7–15 per cent. of those applying for such work (depending on climatic and other factors influencing urine concentration—the latter figure was found here recently during hot weather) may be rejected. These will include the great majority of such carriers as would be detectable were a full examination possible.

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ACKNOWLEDGMENTS

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CORRIGENDA

The following corrections should be made in the previous article in this series, "Studies on Urinary Carriage of Enteric Organisms—1. Quantitative Evaluation of methods for the Concentration of Enteric Group Organisms in Urine" (this Journal, Vol. XCV, No. 6, page 341):

Page 342, line 7: *For* "in urine carrier" *read* "in urine of carrier."
Page 343, line 37: *For* "medium used from" *read* "medium used for."
Page 349, line 36: *For* "2 or 3" *read* "2 of 3."
Page 351, line 22: *For* "tested in" *read* "tested on."
line 38: *For* "1.0 ml. molten agar" *read* "1.0 ml. in molten agar."
Page 352, line 4: *For* "20 to 24" *read* "20 to 40."
Page 353, line 35: *For* "field culture" *read* "fluid culture."

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MEDICAL COVER

BY

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[*Continued from page* 188, *March issue*]

General Medical Services

The Officer in Medical Charge of Troops corresponds in a general sense to the civilian General Practitioner in his work. There is a certain difference, however, in that his duty is not only to treat the sick, but also to preserve or improve the health of the fit. He has therefore certain "public health" functions to perform, and these are considered to be more important than his actual therapeutic work. His duties, unlike those of the General Practitioner, are clearly defined. In addition to the running of his Medical Inspection Room, his duties include the following :

1. Supervision of the environmental hygiene of his men in all its aspects.
2. The control of infectious disease.
3. The supervision of the conditions under which his men carry out their work and training, paying special regard to the nature of their work, hours of work, hours of rest, recreational and welfare amenities.
4. If there are families in the station, the organization of child welfare and school health services.
5. Training in certain subjects such as First Aid.

From the point of view of treatment of cases, his scope is somewhat limited. It is disadvantageous to have sick men within the unit, and therefore the Army Hospital system has been devised in such a way as to obviate this. For one thing, they hamper active operations, and for another, their presence is bad for morale. Also, the living conditions of the soldier are not conducive to domiciliary treatment in bed, and the equipment of a Medical Inspection Room is not really adequate to cover the treatment of seriously ill persons. The rule is, therefore, for the Medical Officer to send to Hospital or Reception Station, depending on the severity of the case, all cases of sickness other than the minor sick who can be treated satisfactorily within the unit lines.

Unit "Sick-bays" have been established from time to time, and under war conditions in certain circumstances were undoubtedly of value. However, under peace-time conditions, when adequate nursing facilities can be obtained without any difficulty in all military stations, they are unnecessary.

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The Army doctor, therefore, whose interests lie mainly in the fields of curative medicine, may not get the same degree of satisfaction out of treating his patients as does his civilian counterpart, because, as it is often said, as soon as they become interesting they have to be passed on to someone else.

In view of modern developments in diagnostic and therapeutic technique, the civilian practitioner is tending to make much greater use of hospital facilities than was previously the case. The Army system, therefore, of passing on anything at all complicated to the hospital is becoming more and more familiar in civil practice.

From the patient's point of view, being rapidly passed from one doctor to another, with a constant repetition of symptoms and history, tends to lead to discontent, and a feeling that no one is really interested in his particular case. However, as it has already been pointed out, there is a sound reason behind all this moving of patients, and it may be confidently asserted that the patient's treatment and eventual cure are in no way prejudiced by it.

As far as the military families are concerned, the Army doctor's role is almost identical with that of the civilian General Practitioner. Home nursing is generally used, a Nursing·Sister of the Queen Alexandra's Royal Army Nursing Corps fulfils the role of District Nurse and Health Visitor overseas, and hospital is only resorted to in cases of serious illness. The proportion of families to military personnel, however, is generally extremely small, and so this part of an Army doctor's duty is a very small though nevertheless very important one.

In some instances, in a large station for example, when the number of families is sufficient to justify it, one Medical Officer is appointed exclusively for the medical care of families. Often he is also in charge of the Families' Wing of the Hospital, and undertakes all the midwifery. The officer chosen for such an appointment is generally a specialist in the diseases of women and children.

Each Officer in Medical Charge of Troops is appointed either to a single large unit or, more commonly in peace time, to a group of units situated in a particular area. All members of these units and their dependants come under his medical charge, and he is fully responsible in every way for their health. They, on the other hand, have no free choice of doctor and have to accept him as their medical adviser, and he, on the other hand, has to accept them all as his patients.

This is fundamentally different from the principles of civil practice, when everybody is free to choose his own doctor, wherever he may reside, and, conversely every General Practitioner is free to accept or reject any patient who applies to be included in the list of those under his medical care.

One can visualize certain difficulties arising as a result of this arrangement. A patient, for some personal reason, may lose confidence in his medical adviser, and will consequently feel frustrated and hostile in having to accept his advice. Similarly, the doctor may have a certain prejudice against one of his own patients, which will somewhat influence his professional attitude towards him, although this, luckily, is rare.

In civil life, any patient who feels dissatisfied with his doctor for any reason is free to make a change, to the mutual benefit of both parties concerned as a rule.

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Certain members of the Army community, who feel that this privilege is being withheld from them, often develop a feeling of bitterness towards the Army Medical Services in general, which they frequently voice to the detriment of the Service in the hearing of both the Army and the civil population.

Frequent changes in the Medical Officer to a particular unit or area also cause dissatisfaction and lack of confidence among the personnel concerned. The average person regards his doctor as his confidential adviser, and, having once confided in him all his personal affairs, resents having to repeat his confidences all over again to another doctor.

Changes among General Practitioners are comparatively rare in civil life, and an established "family doctor" who does not change as time goes by implants a feeling of confidence and security. The Army doctor, although he aims to achieve the position, finds it much harder to establish himself as the friend and confidential adviser to his patients when either he or they are liable to be moved to another place at any time.

The Army doctor lives in a much more intimate relationship with his patients than does the civilian. Very often he lives in a Mess with officers for whom he is medically responsible. He is constantly moving about among his patients in the unit lines, and has a unique opportunity to get to know them personally. Similarly, his patients have a good opportunity of getting to know him as an individual as well as their medical adviser.

Such opportunity is generally denied to the civilian practitioner, who as a rule only sees his patients when they are in need of his advice.

The ability to move about among his patients and study them at work and at play gives the Army doctor a great advantage when called upon to advise them when they are sick. Knowledge of a patient's mode of life and habits is half the battle when making a diagnosis or prescribing treatment, and by playing an active part in regimental life the doctor finds his job very much simplified.

Embarrassing situations can arise, of course, under these circumstances, such as when the Regimental Medical Officer finds himself at a Mess dinner sitting next to a senior officer to whom a short while before he was giving very careful and detailed advice about diet, only to find that all his valuable words have been thrown to the wind!

However, it is always of value for a doctor to learn just how far his advice is generally taken, and lessons can be learned from such situations as this.

The Army doctor holds a definite rank, and comes under a senior officer for administrative and disciplinary purposes. This may be either the Commanding Officer of the Regiment to which he is attached or, generally in peace time, a senior Medical Officer. Nevertheless, his professional status is in no way impaired, and his advice as a Medical Authority must be accepted. It may seem a bit out of place for a Lieutenant or Captain to give advice to a Lieutenant-Colonel, but with a good Commanding Officer this is not the case, and it is generally only a bad doctor who fails to make a good impression of his professional capability.

The Unit Medical Officer is generally a highly respected member of the

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military community in the eyes of the officers, the men, and their families. The commonest complaint made against him is that he does not stay with the unit long enough.

The civilian General Practitioner in comparison possesses much more personal freedom. Although under the National Health Service Act he comes under the control of his Local Executive Council and has lost a certain amount of his former independence, he is free to live as private or as public a life within his community as he may choose. He is able to stay in one place as long as he likes, or move when he feels like it. His "rank" is purely that of a professional man and nothing else.

How this freedom is likely to be further affected in the future as the new service develops remains to be seen. It is to be hoped that if individuality is to become curtailed in the interest of the National Health Service, team work will take its place along the lines that are now familiar in Army life.

In spite of the different modes of life, therefore, the military doctor can, by applying the same principles of professional integrity, achieve a very similar position in society to the civilian practitioner.

In a predominantly male community the lack of freedom of choice of doctor seldom gives rise to any trouble. The average male in civil life seldom attaches a great deal of importance to his choice of doctor, generally selecting the one most conveniently situated geographically. Similarly, in the Army he generally accepts without question the Medical Officer of his unit. Among the female element of the community, however, especially those with families to look after, much more importance is attached to the choice of doctor. It is therefore more commonly among the Army families that complaints and dissatisfaction about the Medical Services are likely to arise. It is therefore essential that extreme tact must be used in dealing with this branch of the community, and care must be exercised by the administrative medical staff in selecting a suitable person to take over an appointment with big family commitments.

The method of conducting an Army "practice" is entirely different. Except for the families, there is practically no visiting to do, all patients attending the doctor in his consulting room. This enables the doctor to be able to work more or less to a time-table, which a civilian General Practitioner can hardly ever do.

The treatment prescribed by the Army doctor is unquestioned. There can be no abuse of the service by excessive demands by the patients for dressings and drugs, and the doctor cannot be "blackmailed" by threat to transfer to another doctor.

Owing to the generous supply of medical manpower, the low incidence of sickness as a whole, and the system of evacuation of cases requiring treatment in bed, the Army Medical Officer can satisfactorily divide his time between curative and preventive medicine.

Thus the Army Medical Services, owing to their nature and purpose, have achieved a very satisfactory union between the two aspects of medicine, preventive and curative, which civil medicine by means of the National Health Service is only just beginning to attempt.

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Summary and Conclusions

The aim of any comprehensive medical service is to provide means of both curing and preventing disease within a community, in the most efficient way possible. The methods by which these means are provided vary of course with the community concerned. In comparing two such communities as the British Army and the civilian population of England and Wales, the modes of living and the nature and composition of the two must first be considered.

The Army community is composed mainly of young healthy males, aged between 17 and 23 years. They have to be maintained in a fit state to move to any part of the world and fight when required. Those who are not up to the required standard of health are not retained in the Army and become a civilian responsibility.

The civil community, on the other hand, embraces all age groups and all states of health. It is, however, comparatively static, and does not require the same degree of control to be exercised over its living conditions.

The medical service therefore adapt themselves to the community to which they apply. In the Army their main purpose is the prevention of diseases, the improvement of health, and the provision for casualties due to wounding and sickness associated with the theatres in which the Army is required to perform. The hospital services have to be extended to cover both major and minor cases, there being no domiciliary treatment. In war time elaborate arrangements need to be made for the evacuation of casualties from the field of battle, and a large number of doctors and other medical personnel become fully occupied in ensuring that these are efficiently carried out. The link between preventive and curative medicine is strongly forged. Administration is centralized and uniform, and the various branches of the service are closely integrated.

In the civil community, attention needs to be paid to those classes of the population who are not represented in the Army—namely, the chronically ill, the physically unfit, the very young and the aged. The hospital service is provided only for those who are seriously ill or urgently in need of hospital treatment. The General Practitioner covers all other types of case. Public Health services are run independently of curative services, and are chiefly directed towards certain sections of the community only.

Administration of the National Health Service is not centralized to the same extent as the Army. More autonomy is allowed, and there is much less uniformity at present. Lay administration plays a much greater part. Integration between the three branches of the service is not at present very firm, but it is a matter of conjecture as to how future developments will improve this.

Certain groups of the civil community are not covered so thoroughly by the National Health Service as are their counterparts in Army Life. The control of health in industry is still independent of the National Health Service. How long this is to last remains to be seen. A truly comprehensive medical service should cover all aspects of life, and in the Army working conditions and hazards of work are carefully kept under medical supervision.

In the civilian community, also, there must be a large number of persons

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living alone or in lodgings who cannot be adequately nursed at home when they are ill, although not suitable cases for hospital according to the accepted standards. The Army system of providing hospital or reception station beds to cover such cases solves this problem in the military community, and it is to be wondered whether in time, when the country can afford it, civilian "Reception Stations" for such cases will ever be formed.

The combined functions of prevention and cure of disease performed by the Medical Officer in charge of troops are not carried out by the civilian General Practitioner. It is at present doubtful if they ever will or could be. The Army doctor, owing to the nature of his patients and the methods of the service, is able to carry out the dual function with ease. The General Practitioner, on the other hand, is generally far too occupied at present with treating the sick to be able to devote any time to preventive measures, and a radical change in his mode of work would have to be made to enable him to do so. However, it is the ultimate aim of the National Health Service to bring these two aspects of medicine together, and it is to be hoped that in time this object will be achieved.

Team work and co-operation are essential qualities of a comprehensive medical service. They are found throughout the Army, and it is to be hoped that as the National Health Service develops they will flourish in civil medicine at all levels too. A doctor is essentially an individualist, but it must be borne in mind that good team work brings out the best individual qualities of each member of the team.

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At Random

ALL IN THE DAY'S WORK

PART I

GIVING

EXTRACTS OF QUARTERLY WAR REPORTS

BY

Colonel E. I. B. HARVEY, D.S.O.
Late Royal Army Medical Corps

and

Lieut.-Colonel (now Colonel) M. E. M. HERFORD, D.S.O., M.B.E., M.C.
Royal Army Medical Corps (T.A.)

WHILE perusing Quarterly Reports of fighting formations for purposes of writing the campaigns of the Medical History of the War, two reports of the medical aspect of Operation "Market" and the fighting round Arnhem came to notice. These reports, which give, in a completely *matter-of-fact* and *all-in-the-day's-work* manner, incidents which might well have been taken from a Henty thriller, were so striking that we reproduce them here with the authors' consents.

REPORT ON THE MEDICAL SERVICES—AIRBORNE DIVISION

OPERATION "MARKET"

BY

COLONEL E. I. B. HARVEY, D.S.O., A.D.M.S., 1 AIRBORNE DIVISION
(*not present on operation*)

This report has been compiled from evidence collected from returned personnel, and two letters from Medical Officers in enemy hands.

1. NARRATIVE OF EVENTS.

On 17 Sept., 16 Para. Fd. Amb. (Lt.-Col. E. Townsend, M.C.) were dropped accurately and landed with full equipment and personnel. 181 Air Ldg. Fd. Amb. (Lt.-Col. A. T. Marrable) less one section landed successfully in nine gliders.

16 Para. Fd. Amb. proceeded direct to Arnhem and established a D.S. in Saint Elizabeth Hospital which was opened by 22.00 hours.

181 Air Ldg. Fd. Amb. opened a D.S. at once in the area of the L.Z., and casualties were received shortly after landing, some of these being landing injuries.

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During this and the succeeding day the Medical Services functioned according to plan, the responsibility for casualties of the second lift being undertaken by 133 Para. Fd. Amb. (Lt.-Col. W. C. Alford, O.B.E.) and the reserve section of 181 Air Ldg. Fd. Amb.

By the evening of 19 Sept. both 133 Para. Fd. Amb. and 181 Air Ldg. Fd. Amb. were established side by side in Osterbeek. *En route* 133 Para. Fd. Amb. had been delayed by the enemy who were in close contact in the area of Osterbeek.

On 20 Sept. both medical units in Osterbeek were captured, and the majority of Medical Officers and R.A.M.C. personnel were removed to a P.O.W. cage, but a small number were allowed to remain with some 40 seriously wounded casualties.

From 21 Sept. these two units, or that part of them that had been left in the area, united to form a small hospital, centred in the Municipal Hospital.

16 Para. Fd. Amb. was captured in Arnhem on 18 Sept. and the C.O. and majority of Medical Officers were sent off as P.O.W. After protest, the surgical teams were allowed to remain to care for some thirty serious cases.

Thus by 20 Sept. all three medical units were in enemy hands and the Divisional Medical Services comprised the reserve section of 181 Air Ldg. Fd. Amb., A.D.M.S. (Col. G. M. Warrack), and his staff and certain R.M.Os. These were all amalgamated and casualties from within the perimeter were collected to this improvised dressing station.

On 26 Sept. certain medical personnel, including Lt.-Cols. Alford and Marrable, were apparently released to work in the D.S. at Osterbeek, and this installation seems to have carried on as a Dressing Station until 27 Sept.

On 24 Sept. Lt.-Col. Herford of 163 Fd. Amb. organized an attempt to get medical supplies over the river. He and Capt. Louis, R.A.M.C., would attempt to take over six cwt. of medical stores with four medical orderlies. This was made in daylight, at 14.30 hours on 24 Sept. Lt.-Col. Herford constituted himself an envoy and made contact with the senior German officer after crossing the river by assault boat. It appears that Capt. Louis and his party were made P.O.W. and nothing further has been heard of them.

Lt.-Col. Herford made contact with the senior German medical officer, and arranged for the barracks at Apeldoorn to become a hospital for British wounded. This was staffed by personnel who arrived from Osterbeek on 26 Sept. Col. G. M. Warrack also arrived on that day and took command of the hospital. At the same time as the hospital was being organized parties of wounded and medical personnel were being evacuated to the interior of Germany. The evacuation arrangements were bad, but as a result of strong protests from Lt.-Col. Herford the arrangements were improved and properly equipped hospital trains were provided.

Valuable assistance was rendered by the Dutch, who provided some medical stores and offered the services of Dutch Surgeons. Many British wounded were distributed among a number of German hospitals in the area; some of these were brought into the barracks, but the majority were evacuated.

By 30 Sept. there were some 850 cases and 250 personnel in the hospital. Evacuation proceeded from time to time up till 16 Oct., when the hospital was almost clear. The majority of personnel had by this time been sent back to the Hanover area as P.O.W. Lt.-Col. Herford escaped from the hospital on the night of 16 Oct.; Col. G. M. Warrack and Lt.-Col. A. T. Marrable were still there.

The hospital at Arnhem was closed on 12 Oct., and remaining personnel sent to Apeldoorn.

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A further attempt to get medical stores across the river had been made on the night of 24 Sept. by Lt. (Q.M.) J. Tiernan, 181 Air Ldg. Fd. Amb.; six half-ton blocks, mainly plasma, sulpha drugs, dressings and blankets, were made up by Lt. (Q.M.) J. Tiernan, and he, with some 20 other ranks, was ferried across in DUKWs and assault craft. These were sunk on the north bank and it was impossible to land the stores. Lt. (Q.M.) J. Tiernan remained all day on the north side and swam back on the night of 25 Sept.

The withdrawal of 1 Airborne Division took place during the night of 25 Sept.

REPORT—PERIOD 24 SEPT. TO 19 OCT., '44

BY

LIEUT.-COLONEL M. E. M. HERFORD, D.S.O., M.B.E.

From: O.C. 163rd (Br.) Field Ambulance, R.A.M.C.

Having failed on the night 23/24 to get facilities for sending any supplies to the 1st (Br.) Airborne Division, I went to H.Q. 130 Bde. on 24th and again found the position very indefinite. Ultimately, permission was obtained for three lines of action:

(i) To send 2 M.Os. and 12 men spread over 6 DUKWs, each of which was to carry half a ton of medical supplies from the Seaborne Tail of the Airborne Division. Crossing at night 24/25.

(ii) One officer and thirty medical orderlies each carrying an assault pack of medical supplies to cross in assault boats at night.

(iii) The Corps Commander gave permission for an attempt to be made to take supplies over in daylight under cover of the Red Cross.

At 14.30 hrs. on 24th, after reconnoitre, I displayed the Red Cross on the river bank near Driel, and then, accompanied by Capt. Louis of the Airborne Corps H.Q. and four medical orderlies of 163 Field Ambulance (Hill, Moore, Keeghan and Bean), carried down about 6 cwts. of emergency supplies. We then searched the bank and found an assault boat left from the previous night's activities. We loaded the boat and paddled across. Leaving the party on the bank, I went forward to reconnoitre.

There were three possibilities:

(i) Enemy fire would terminate the proceeding.

(ii) We should get through to the Airborne Division, deliver the supplies and prepare for the evening's operation and send back information.

(iii) Make direct contact with the enemy lines and request passage. In view of the uncertainty concerning the exact width and position of the corridor and the fact that we carried bulky supplies this appeared inevitable. In this event I had decided to constitute myself an envoy and request to see a senior German Officer to make the following demands.

   (*a*) The immediate passage of the supplies.

   (*b*) The passage of further supplies.

   (*c*) To request facilities for the immediate evacuation of the large number of badly wounded men known to be in constant danger and in need of treatment.

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The German lines were encountered. I immediately requested to see a senior officer and was asked if I was an envoy. I said I was. They agreed and immediately blindfolded me. I stipulated that if they did not agree, my party should be sent back at once. The German soldier took my Red Cross flag and said he would go out and bring them in. They were in full view of the bank. Meanwhile I was led off, expecting to see an officer almost immediately. In point of fact it was nearly an hour before the soldiers found a senior officer, and there appeared to be very few officers about. In this way I lost contact with Capt. Louis, although they promised the party would be respected.

The Commander to whom I was taken blindfolded said he could not deal with the matter.

I was sent on to Regimental H.Q. who said they had no power, and then taken by car to Div. H.Q. So-called Div. H.Q. because I was told afterwards they were fighting as battle groups.

At Div. H.Q. it was now dark. I detailed the requests and they said they would be considered—especially No. 3. They were evidently very confident of liquidating the Airborne Division next day, as they considered they were in a hopeless position. I did my best to stress the great power of the relieving forces.

They queried my position as envoy in view of the display of the Red Cross flag instead of the white flag. I said that in view of my position as a Medical Officer having medical stores and interested solely in the wounded, the Red Cross flag was sufficient. After consultation they agreed to regard me as a special prisoner, but not as an envoy, and said I would be sent to see the Chief Regional Medical Officer, Lt.-Col. Zingerlin, who would assist in every way possible with the evacuation of casualties. I was then in Ede.

25 *Sept.*

Early in the morning I was sent to Schloss Haetloo (Queen Wilhelmina's Castle), a large German Military Hospital, nr. Apeldoorn. Lt.-Col. Zingerlin, a very reasonable, efficient man, said that at 06.00 hrs. the evacuation of casualties had commenced. The A.D.M.S., 1st Airborne Division, had approached the enemy on 24th to request evacuation, and they promised full assistance. There were over 2,000 German casualties in the area and the hospitals were overflowing. He was expecting 1,500 British casualties. He took me to a large barracks where he expected to be able to put 250 lightly wounded with a British M.O. After that we visited two German Hospitals. At the second I met Capt. Redman of 133 A.B. Fd. Amb., who had been shot through the arm on landing, and taken prisoner. He was looking after 120 British wounded, and had been invaluable. He told me that practically the whole of 133 Fd. Amb. were in Arnhem, prisoners. I suggested to Zingerlin the barracks should be made a British Hospital, and staffed by our Medical personnel. He agreed. By the afternoon casualties were pouring into the barracks, and were being laid in rows upon piles of straw. Supplies were promised.

Zingerlin then took me to Arnhem, blindfolded:

(*a*) To see an S.S. General (Doctor) to ask permission to go back to the river to signal some of the Airborne medical supplies across.

(*b*) To arrange for a Surgical Team from 133 and M.Os. to come to the barracks.

The General decided I was a prisoner and need not be blindfolded. He agreed to consider the proposal for fetching stores. At Arnhem Elizabeth Hospital I saw Major

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Longland of 133. There were 300 British casualties. He agreed to send a Surgical Team and Orderlies as soon as the Germans sent transport. Zingerlin lamented the great shortage of transport and particularly of petrol.

Returning to the Barracks (Wilhelm III Caserna) I found casualties still pouring in.

There was only Capt. Redman and 8 Orderlies to help. By 21.00 hrs. there was 800. In spite of his wound, Redman worked all through the night and organized as much as possible.

26 *Sept.*

At 02.00 hrs. a German doctor arrived and said that they wished to evacuate 500 lightly wounded at 09.00 hrs. We selected this number. At 04.00 hrs. some personnel arrived from Arnhem; the cheerfulness and patience of the wounded was beyond praise. They had been under fire and in great discomfort and short of food for many days, and yet could laugh and joke when aroused from their first quiet sleep to prepare to go to Germany.

When the 500 were being sent off, another message was received to send 40 stretcher cases. On enquiry I found that it was not a proper Hospital Train but only straw-filled cattle trucks. I refused point blank to send any stretcher cases and said very strong protests would be made if they insisted. Particularly in view of the fact that rest was absolutely essential, and that none of the stretcher cases were fit for transport. They agreed to ask further instructions. A message came to say no stretcher cases were to be sent.

During the morning, Zingerlin arrived, and said we might run a British Hospital and be responsible for returns and discipline, and would be given control of food and supplies which the Germans would make available. All captured Medical personnel would be sent along.

During the day casualties poured in and Lt.-Col. Alford and other M.Os. arrived.

The Germans allowed an M.O. to go back to Osterbeek to collect all British Medical equipment.

During the afternoon Col. Warrack, A.D.M.S. 1st Airborne Division, arrived from Osterbeek, where he had been supervising the evacuation of casualties.

He called a meeting of Senior Officers. I outlined the position and he immediately began a proper Hospital organization. He asked me to act as his 2nd i/c and be Liaison Officer. I spoke sufficient German for this purpose and of the others only Capt. Redman could speak any German at all.

The Germans sent some supplies, and said the request to send over the river for British supplies was under consideration. They were evidently very uncomfortable and feared the arrival of British troops. I stressed the fact that if they treated us well, it would help the very big number of German wounded who would become prisoners, and endeavoured to increase their apprehension in every way. Zingerlin had been in charge at Nijmegen, and I was able to give him first-hand information and the name of the German doctor in charge—stressing how well they were being treated. The Medical personnel of the Airborne Division were astonishingly quick to bring order out of chaos, and worked tremendously hard. In view of the fact that they had been under constant fire without food, and working hard for many days, their work was beyond praise. The spirit of every man, wounded and unwounded was inspiring.

On 28th there was a general search of the Hospital by S.S. (some of them Hermann Goering Division, who had been in Sicily). At first they were truculent, but were at pains to show how scrupulously they regarded personal possessions. In one block

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when a British Officer did not accompany them they were not so scrupulous, and took money with threats from the wounded. The money was, however, collected in a pile for custody. The food was very inadequate and poor, chiefly potatoes and bread. Strong protests were made.

During the afternoon an Intelligence Officer arrived and said I was definitely to be regarded as a prisoner. I protested strongly and he said, after hearing my story, that he had not had full information and would investigate further. General Mayer visited the Hospital with Zingerlin. Col. Warrack suggested that supplies may be dropped by parachute. General Mayer (Chief Medical Officer, Holland) promised to submit this proposal to Field Marshal Model.

Zingerlin had given permission for me to visit the British prisoners in German and Dutch Hospitals near Apeldoorn. There were several hundred. He had also agreed that no further evacuation should take place except in properly equipped Hospital Trains. He stressed that this was a special concession as many of the German wounded travelled in straw-filled cattle trucks due to the shortage of Red Cross trains.

29 *Sept.*

Informed that three Dutch Surgical Teams had volunteered to come from Amsterdam to aid the British wounded, and take all severe cases into Dutch Hospitals. Dr. Tripp, the leading Dutch doctor in the district, aided us in taking a very strong line about treatment and facilities. The Germans were still apprehensive about the British major attack. We almost persuaded them that our positions would be reversed in a matter of days, and then they would be our prisoners.

The position was so comic that Col. Warrack described it as an "Alice in Wonderland" story. We had decided to bluff to the uttermost and play for time. Delaying evacuation in every way possible and protesting to the limit at every turn.

In the afternoon of the 29th we had a further talk with General Mayer. He confirmed the promise of evacuation of stretcher cases only in proper trains. I stressed again my detention as an envoy and he admitted this action was wrong, but said I had seen too much and must be detained. Capt. Louis and the Orderlies, had, he said, been sent back.

30 *Sept.*

Two German Surgeons came round and passed nearly everyone as transportable. Zingerlin came in the afternoon and we protested strongly, saying rest was essential. He ultimately agreed to the evacuation of only 300 lightly wounded in a truck train.

The Dutch Red Cross sent much valuable stores and blankets. Eight hundred and fifty patients and 250 staff in Hospitals.

[*To be continued*]

SPRINGFIELD HOSPITAL, Beechcroft Road, Upper Tooting, London, S.W.17
MALE STUDENT NURSES required. Resident or non-resident. Age 18 to 35 years. Training allowance—£230 1st year, £240 2nd year, £255 3rd year, together with Dependants' allowances where applicable. Cash payments of £50 during training. Meals on duty and uniform provided free. On completion of training salary is £345 p.a. rising to £445 p.a., with opportunities for further promotion. Springfield Hospital is a recognised training school for Mental Nurses and employs all modern forms of treatment for nervous and mental disorders. It is situated within 25 minutes of London's West End. Apply to Chief Male Nurse at the Hospital.

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Clinical and Other Notes

SOCIETY OF MEDICAL OFFICERS OF HEALTH

MEETING OF SERVICES GROUP AT R.A.M. COLLEGE

A MEETING of the Group was held on 8th February, 1952, at the R.A.M. College by invitation of the Commandant, Major-General F. R. H. Mollan, *C.B., O.B.E., M.C.*

The Commandant invited the meeting to stand in silence for one minute as a tribute of respect to the memory of His late Majesty King George VI, following which he made a short speech to welcome the Group on the occasion of their third meeting at the College. A short film to illustrate the physiological research which lies behind the production of the new Korean boot was shown by courtesy of Dr. E. T. Renbourn, Superintendent of the Clothing and Equipment, Physiological Research Establishment, Ministry of Supply. Major A. M. Reid of the C.E.P.R.E. gave a helpful commentary, and the sequences taken in the Cold Chamber were of particular interest.

The film was followed by a demonstration laid out in the Army Health Laboratory. Here the clothing sent to Korea for this winter was demonstrated on "mannequins" recruited from the current course for laboratory technicians. As a contrast, tropical clothing was also shown.

Near by was an exhibit of the effects of cold and the use of cold weather clothing. The new Snow Ration in its transparent wrapper looked like a gift parcel from a fashionable confectioner ; doubts whether it would survive the evening were unjustified as the Group nobly withstood temptation. With the Snow Ration other new ration packs were shown, the 10-men and 5-men Compo and the 24-hour pack.

An exhibit on Acute Hæmorrhagic or "Songo" Fever had *Apodemus agrarius*, the villain of the piece, stretched out in the middle. He was not alone ; a beautifully illustrated exhibit of Mite Typhus included specimens of the rodent hosts of this disease and left anyone who didn't know a bandicoot from a bandersnatch no excuse for further ignorance.

The pathological demonstration on the laboratory diagnosis of enteric fever was up to the usual high standard and contained some excellent plates in the section on phage typing.

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Other interesting demonstrations were those on Anti-Malarial Oils and Health Education. The last included photographs sent specially from the Far East School of Hygiene and also models of the Woodbeery Down Health Centre which is being built at Stoke Newington ; these models were kindly lent by the Public Health Department of the London County Council.

Another exhibit which had been sent from the Far East was a valuable series of photographs of anti-malarial work in Singapore District. Leptospirosis was dealt with in a comprehensive demonstration which showed interesting photographs of occupational hazards as well as clinical and pathological material.

A further section demonstrated the new method of Inter-Service Medical Documentation by relating the documents to incidents in the medical history of a soldier.

The library was, as usual, the centre of the most interesting display of books, documents, *et al.* The exhibits ranged from the skull of a negro who had suffered from Goundou to Lord Wolesley's opinion of the sanitary officer, "a very useless functionary." Perhaps as a result of the support given by coffee and sandwiches the members of the Group seemed very little upset by this unflattering verdict on their predecessors.

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Matters of Interest

NOTES FROM A.M.D.

BY OUR SPECIAL CORRESPONDENT

I

THE latest alterations to the Army List are as follows :

To be Colonel, February 16, 1952 : Lieut.-Colonel W. A. Y. Knight.

To be Lieut.-Colonel : Majors T. M. Fowler, February 4, 1952 ; C. McNeil, February 16, 1952 ; N. Bickford, February 25, 1952.

II

EXAMINATION RESULTS

THE following medical officers, who have been attending courses at the R.A.M. College, recently obtained the post-graduate qualifications noted against their names :

Captain B. Bevan, R.A.M.C., D.T.M. and H. (Eng.)
Major A. B. Dick, R.A.M.C., D.T.M. and H. (Eng.)
Major B. Devlin, R.A.M.C., D.T.M. and H. (Eng.)
Major E. M. Ensor, R.A.M.C., D.T.M. and H. (Eng.)
Major F. W. Hooper, R.A.M.C., C.P.H. (London)
Major J. G. S. Holman, R.A.M.C., D.P.H. (London)
Major J. H. Maclaughlin, R.A.M.C., D.T.M. and H. (Eng.)
Major T. A. Pace, *O.B.E.*, R.A.M.C., D.P.H. (Eng.)
Major W. R. West-Watson, R.A.M.C., D.T.M. and H. (Eng.)
Major E. D. H. Williams, R.A.M.C., D.P.H. (Eng.)

Lieut.-Colonel J. Abbas, P.A.M.C., C.P.H. (London)
Captain Hla Tin, Burma Army, D.T.M. and H. (Eng.)

This again is a success of 100 per cent. passes for the College.

III

THE MEDICAL SERVICES WELFARE AND COMFORTS FUND

LETTERS of thanks have been received by the Director-General from the A.D.M.S., British Commonwealth Division in Korea, and also from Medical units in the Division, expressing their thanks and appreciation for the parcels of books, magazines, games and scarves which have been sent to them by the Medical Services Welfare and Comforts Fund.

To date, ten parcels of books, three parcels of games, and twenty dozen woollen scarves have been dispatched by the Fund.

It is stressed, however, that there is still an urgent need for donations of money, magazines, and paper-backed novels, and further contributions will therefore be very gratefully received.

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Correspondence

I

THE ORCHARD,
CHEW MAGNA,
NR. BRISTOL.
22nd February, 1952

DEAR EDITOR,

I feel my duty to write and express to you my appreciation of the recent developments in the R.A.M.C. Journal. As far as I can judge the academic and service articles are now at a very high standard, and I am sorry to hear of any suggestion of the Journal ceasing.

Yours faithfully,
F. J. BRACKENRIDGE, *Colonel* (Retired)

Editor's Note.—This is one of many letters received recently on this subject. Colonel Brackenridge in another letter makes the suggestion that *each number of the Journal should have one article on a non-professional subject*—sport, travel, historical, or any matter of general interest. WILL AUTHORS PLEASE OBLIGE.

II

DEPARTMENT OF ARMY HEALTH,
ROYAL ARMY MEDICAL COLLEGE.
25th February, 1952

The Editor, Journal of the R.A.M.C.

DEAR SIR,

I am glad that Lieut.-Colonel J. T. Robinson has explained and elaborated his previous criticism of my article on Mental Health (his letter, January issue of Vol. XCVIII) by writing to you again.

There are a few points I would like to make before this correspondence is concluded as far as I am concerned.

1. With regard to the correlation between "illiteracy" and low intelligence. I still contend that there is a positive correlation between these two factors. The concept is a statistical one, and the sequence of logical argument is as follows :

(*a*) Let us see whether illiteracy and low intelligence are likely to be *associated*. If these factors are *not* associated we should expect to find that a random sample reveals the same level of intelligence among illiterates as among literate individuals.

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My hypothesis that these factors *are* associated can be tested by the chi-squared test, using the formula $\chi^2 = \frac{\Sigma(O-E)^2}{E}$

I contend that we should find an association greater than might be expected to occur by chance, and that the value for "P" would be less than 0.05 ; in other words the association would be *significant*.

(*b*) Having found a significant *association* our next step would be to measure the *strength* of this association. To do this we should calculate the coefficient of correlation, using the formula

$$r = \frac{\frac{\Sigma xy}{n} - (\bar{x}\,\bar{y})}{\sigma x\ \sigma y}$$

I contend that we should find a significant positive correlation.

Lieut.-Colonel Robinson suggests that study of a random sample would reveal the same level of intelligence among illiterates as among literate individuals. Perhaps either he or I will be able to study such a sample one day ; it is evident that we should both be keenly interested in the results !

2. I agree that if men of low intelligence are employed in messes, kitchens and cookhouses without actually handling food for human consumption they are less likely to endanger the community. That is the point I have been trying to make all along !

3. Lieut.-Colonel Robinson agrees that mental defectives in institutions are liable to suffer from an incidence of intestinal disease higher than that of the rest of the community.

Although men of low intelligence employed in the Army are certainly not defectives in the technical sense, I still contend that there are some factors, apparently linked with intelligence and resulting in a greater incidence of these diseases, which they share with their less fortunate brethren in institutions. I feel it is unlikely that the tendency to intestinal disease is limited only to those who are defective "within the meaning of the Act."

As Lieut.-Colonel Robinson points out, it would be useful if my personal observations on this point could be the subject of a survey with proper controls ; perhaps one of us will be able to conduct such a survey at some future date.

4. I heartily agree with Lieut.-Colonel Robinson that no psychiatrist, or any other medical officer for that matter, should be looked upon as an instrument for getting rid of a "difficult man" from the Army. I think my article has been subject to a certain amount of misinterpretation on that point.

5. I like Lieut.-Colonel Robinson's note on the obsessional state ; it clears up that particular point very lucidly.

6. In conclusion, I should like to thank Lieut.-Colonel Robinson for entering into the "cut and thrust of debate" in so spirited a fashion. He should not have regretted causing offence, for he caused none.

Yours sincerely,

M. M. Lewis, *Major*, *R.A.M.C.*

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Obituary

COLONEL JOHN WARD EAMES

In Shrewsbury, on 15th February, 1952, suddenly. Late R.A.M.C. Born 18th August, 1901, he was commissioned Lieutenant R.A.M.C., T.A., 26th January, 1927, and was appointed Lieutenant R.A.M.C., 1st October, 1927, with antedate to 1st October, 1926.

He served in India and Burma from 1939 to 1946, being mentioned in the Burma despatches in *London Gazette* 5th April, 1945, and receiving the 1939-1945 and Burma Stars and the Defence and War Medals.

The Corps and his many friends in it have suffered a great loss by the sudden death of Colonel J. W. Eames whilst on leave before taking up a new appointment.

Colonel Eames was the only son of Lieut.-Colonel C. W. Eames, *D.S.O.*, *T.D.*, who served in the 62nd West Riding Division in France and Germany in the 1914-1918 war and was acting A.D.M.S. at the second battle of Cambrai.

He qualified at Leeds University, where his father and grandfather before him were associated with the Medical School, and where his father was one of the first graduates of the new University. As a student he was surgical dresser to Lord Moynihan, who always regarded him with affection. Before joining the R.A.M.C. he was R.S.O. at the Royal Gwent Hospital, Newport, where he began his long association with the study of venereal diseases.

He held a commission in the Territorial Army before appointment to a Regular commission in 1926.

Whilst not a star performer at games, he enjoyed any that were available, and during the war played hockey with his units in Burma and India when well over forty. Lately he had thrown himself with youthful enthusiasm into the study of yachting and small boat racing which he was teaching to his children. The flourishing Rowing Club at B.M.H. Hamburg was started by him. Jack Eames's unfailing enjoyment of life, his sense of humour and hearty infectious laugh, and a certain jauntiness soon earned him the nickname of "the Baron" by which many of us always knew him. Many officers and other ranks who served under his command during the war have spoken most warmly of the way in which in often depressing conditions he kept up his spirits and those of his unit, which he welded into a harmonious team and a happy family.

Recently he assumed with success a new role—A.D.M.S. of an armoured division ; but those who attended the Director-General's exercise in December,

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1951, will surely remember him best for the warm eloquence with which he showed that in spirit he was still the true professional specialist.

Our most sincere sympathy is extended to his father, his widow and to his children.

F. M. R. and J. G. F.

COLONEL MICHAEL PATRICK POWER, O.B.E., M.C.

SUDDENLY, in London, on 28th February, 1952. Born 15th August, 1889, educated at Edinburgh and Glasgow in 1913, he was appointed temporary Lieutenant R.A.M.C., 4th December, 1914. He retired 10th October, 1948.

He served in France from 1915 to 1918, with a spell in Italy from December, 1917, to March, 1918, and received the M.C.

He was again on active service in the Waziristan expeditions in 1919-1921 and 1921-1924. Twice mentioned in despatches, he received the O.B.E.

He served on the North-West Frontier of India in 1930-1, being mentioned, and on the North-West Frontier of India, 1936-7, he received the new Frontier Medal with clasp ; again in the Mohmand Expedition of 1935, being mentioned ; then again in 1936-7 and in 1937-1939, being again mentioned and receiving a Brevet of Lieutenant-Colonel. He served in France in 1939-40, in India from 1942 to 1945, in the Central Mediterranean 1945 to 1946 and in the Middle East, and was mentioned for his services in France.

J. G. F.

MAJOR JAMES MACKIE CUTHBERT

IN Edinburgh, on 20th February, 1952. Born in 1875, he took the M.B., Edinburgh, in 1893 and entered the Service April, 1900.

He served in France from 1914 till April, 1916, and in Mesopotamia from 1917 till July, 1920.

J. G. F.

LIEUT.-COLONEL HENRY ARTHUR BERRYMAN, O.B.E.

ON 1st March, 1952, in Bath. Born in St. Austell, Cornwall, 3rd December, 1865, he entered the Army as Surgeon-Lieutenant, 30th January, 1893. He retired 5th February, 1913, and rejoined 6th August, 1914. Promoted Brevet Lieutenant-Colonel 3rd June, 1917, he was awarded the O.B.E., 1917. He took part in the operations in Cape Colony, Orange River Colony and Transvaal in 1901 and 1902.

J. G. F.

LIEUT.-COLONEL ARTHUR CARR OSBURN, D.S.O.

IN Bournemouth, on 7th March, 1952. Youngest son of the late Commander Francis Osburn, R.N., and grandson of the late Captain Bushell, R.N., he was born 15th November, 1876. He served in the Artists Rifles, in the Dorsetshire

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Hussars (Dorsetshire Yeomanry) and in the ranks and as Temporary Captain in the Imperial Yeomanry. He entered the R.A.M.C. as Lieutenant 31st August, 1903. He retired 1st June, 1923. He contested Walsall in the General Election, 1923. He was the author of "Carrick-an-Arth," "Must England lose India ?" 1930, and "Unwilling Passenger."

He served with the Imperial Yeomanry in the operations in the Transvaal, including action near Johannesburg, the operations in the Orange River Colony and Cape Colony in 1899-1900.

He served in France 1914-1918; wounded and five times mentioned in despatches; he was awarded the D.S.O. and Bar. The bar was awarded for conspicuous gallantry and devotion to duty. "On seeing the enemy approaching close to his dressing station, he carried out the evacuation of the wounded under heavy shell and rifle fire in the coolest and most gallant manner. Having cleared away all cases by ambulance train and cars, he re-established his dressing station farther in rear. The successful evacuation of the wounded from the divisional front was due to his careful organization and fearless supervision under the most trying conditions. He was an example of gallantry, courage, and resource worthy of the highest praise."

J. G. F.

Book Reviews

ESSENTIALS OF NEUROSURGERY. By L. C. Oliver. H. K. Lewis & Co. Ltd. 1951. Price 25s.

This is a well-produced and easily read summary of this special speciality, and in its 192 pages is packed a great deal of good information.

The author has written the book as a guide to trainee neurosurgeons, and as an aid to candidates reading for the higher surgical examinations.

The author is particularly interested in the Surgery of Parkinsonism, and has included a chapter of eight pages on this subject—a rather undue prominence in a work written for the reasons given.

He considers that the neurosurgeon has no exclusive rights in the surgery of the autonomic and peripheral nervous systems, and so has not included these subjects.

He has dealt with sciatica in a separate chapter. He believes that disk protrusion is responsible for most cases of this symptom, including sciatic pain occurring in pregnancy and in spondylolisthesis, and he would recommend

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exploration for a disk protrusion if conservative treatment of spondylolisthesis is unsuccessful.

It is possible that the examiners for higher surgical degrees have not yet been educated up to this standard.

Apart from these criticisms, the book achieves well the objects for which it was written.

A. G. H.

ANÆSTHETICS AND ANÆSTHESIA FOR NURSES. By W. J. Finnie. 1951. Pp. 110. London Nursing Mirror Ltd.

This small book provides in a nutshell an outline of modern anæsthetic practice and a careful description of the anæsthetist's armamentarium. It is simply and clearly written and remarkably comprehensive. The diagrams and photographs are numerous and good.

It should be read by every student nurse, and closely studied by every O.R.A. who wishes to become proficient in anæsthetic-room duties.

K. F. S.

OBSERVATIONS ON THE GENERAL EFFECTS OF INJURY IN MAN—WITH SPECIAL REFERENCE TO WOUND SHOCK. R. T. Grant and E. R. Reeve. M.R.C. Special Report. Series No. 277.

The report of investigations carried out over a period of five years, 1940-1945, on 230 patients suffering from injuries to the limbs and on 80 patients with injuries to the abdomen. The injuries were sustained in air raids, in battle in the Italian campaign, at work, and on the roads.

There are very careful records of the symptoms and signs of the patients when first seen—during resuscitation, during and after operation.

The authors found at the commencement of the study that there is no single conception of what different observers mean by the term shock. Conclusions throughout the book are that whatever we mean by shock, the chief cause of loss of life in the early stages after wounds of the extremities or of the abdomen is loss of blood, and that unless the blood volume is restored fully—early enough and rapidly enough—recovery is unlikely.

The practical applications are, then, to estimate (when the casualty is first seen) how much blood he has lost. An estimate of the size of the wound (in so many Hand Volumes) and of the systolic blood pressure are shown to be reliable rough guides to the volume of transfusion required.

Cases followed through their operative and post-operative course show again that their progress is so largely determined by the degrees to which the blood volume has been restored.

It is a book of over 300 pages, requiring attentive reading, but is of great importance to all who have to deal with the effects of extensive wounds in peace or war, and to all who are uncertain what they mean by the term wound shock—and that means most of us.

Part 4 deals convincingly in 80 pages with the clinical pathology aspects.

A. G. H.

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AN ATLAS OF GENERAL AFFECTIONS OF THE SKELETON. By Sir Thomas Fairbanks, *D.S.O.*, *O.B.E.*, M.S. (M.Ch.Ortho.), F.R.C.S., Consulting Orthopædic Surgeon and Emeritus Lecturer in Orthopædic Surgery, King's College Hospital. E. & S. Livingstone Ltd. 55s.

This is an important book. The author, from his vast experience, has made a classification of skeletal diseases which is most comprehensive, and there are 510 superb illustrations in the book's 411 pages to illustrate various aspects of these diseases. This beautifully produced book from the House of Livingstone is *the* reference volume on diseases of the skeleton. Orthopædic Surgeons of the Corps will wish to possess it. A copy has been placed in the Millbank College Library.

C. M. M.

THE MODE OF ACTION OF ANÆSTHETICS. By T. A. B. Harris. Pp. 768. Edinburgh : E. & S. Livingstone Ltd. 1951.

This book, based on a series of lectures given by the author to Army Trainees in Anæsthesia during the late war, provides a text book of Anæsthesia in novel form.

It contains a wealth of detail of the physiological, pharmacological, chemical and clinical aspects of anæsthesia and analgesia, but, perhaps because it has been transcribed from lecture form, it is not an easy book to read. It lacks direction and sub-headings, there is a tendency to repetition and too often gems of information lie hidden amongst a mass of relatively irrelevant data. An excellent index, however, largely compensates for this, and as a reference book for the advanced student of anæsthesia it must take a foremost place.

K. F. S.

INFORMATION DIGEST. JANUARY, 1952. Published by the Central Council for Health Education, Tavistock House, Tavistock Square, London, W.C.1. Pps. 48. Octv. (Paper ; photolitho) Price 1s. 6d.

This useful digest contains abstracts of recent literature, statistics and references grouped under the following headings : Infant mortality, breast-feeding, child health, population, old age, accidents, industrial accidents and injuries, mental health, tuberculosis, rheumatism, peptic ulcer and cancer.

The information is well arranged and topical ; it would be of considerable value to anyone concerned with health education. Lecturers and others who teach Public Health and Social Medicine would find this digest useful for reference.

It is not easy to keep up to date with topical information useful for health education purposes, and this digest saves one the trouble of ransacking current literature in search of "teaching points."

If all the incidence rates, etc., quoted in the digest could be accompanied by a note of the exact year or period of time to which they refer, the statistical information would be even more useful than it is.

M. M. L.

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Notices

R.A.M.C. MINOR STAFF BAND

The present big drummer's leopard skin is extremely decrepit and we should be grateful if any officer of the Corps could give either a leopard skin or a panther skin. Any communications should be addressed to: The Band Secretary, The Depot and T.E., R.A.M.C., Crookham, Hants.

ARMY ART SOCIETY

There are probably many amateur artists serving in the Forces who have not heard of this Society. It is an entirely unofficial organization and exists to encourage Art amongst past and present members of the three Fighting Services. For several years, very successful exhibitions have been held in London each autumn and these afford an opportunity for young artists—who often have the advantage of painting subjects overseas—to show their works and compare them with others. This adds a real interest and object to their hobby.

The work of serving personnel, of all ranks, is particularly welcome and intending Exhibitors are invited to apply now for particulars about the next (21st) Exhibition. This will be held at the Imperial Institute, South Kensington, from 21st October to 9th November, 1952.

Applications should be addressed to: E. A. Callam, Esq., Hon. Secretary, Army Art Society, 66, Apsley House, St. John's Wood, London, N.W.8.

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To *The Editor*,
Journal of Royal Army Medical Corps.

7th March, 1952

BLOOD TRANSFUSION

Dear Sir,

The International Conference about which we informed you on 21st February, ended its sessions yesterday, after reaching agreement on several fundamental proposals, the objectives of which are to get standardization and interchangeability of the equipment involved both in obtaining blood from donors and in giving transfusion to patients.

Under the rules governing the International Organization for Standardization (ISO) these agreements are now being referred to the standards associations of the member countries for incorporation in their national standards, whilst other proposals which have been found to need further investigation will be subject to review at the next meeting of the International Committee or by correspondence in the meantime.

Although thirty-three countries are members of ISO, the Director of the League of Red Cross Societies has intimated that in view of the interest aroused by this meeting, observers from even more countries were likely to be present at the next conference.

Yours faithfully,
L. G. Watkins,
Head of Publications and Information Department.

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EDITORIAL NOTICES

The Editor will be glad to receive original communications upon professional subjects, travel, personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom de plume*.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the author notifies at the time of submission that he reserves the copyright of the article to himself) become the property of the Library and Journal Committee who will exercise full copyright powers concerning such Articles.

A free issue of twelve reprints will be made to contributors of all main articles.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

MANAGER'S NOTICES

The Annual Subscription for the Journal of the Royal Army Medical Corps is £1 10s., payable in advance. Single copies, 3s. 6d. per copy.

Cheques, etc., should be made payable to the "Journal R.A.M.C.," and crossed "Glyn, Mills & Co."

Communications in regard to subscriptions, change of address, etc., should be addressed "The Manager, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

The attention of subscribers is drawn to the Manager's notice on page 205 of the March issue.

ADVERTISEMENTS

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K.C.S.I., *C.B.*, *C.B.E.*, M.A., D.M.

MANAGER

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Authors are alone responsible for the statements made and the opinions expressed in their papers.

Journal

of the

Royal Army Medical Corps

Original Communications

SOME THOUGHTS ON THE ORGANIZATION OF A FIELD AMBULANCE

BY

Colonel P. J. RICHARDS, D.S.O., O.B.E.

A PAPER on unit organization can be dry reading if it is no more than a catalogue of sub-units and duties, but it can be more interesting if one considers the way in which a unit's characteristics can be affected by its organization.

But first one must define the relationship between organization and deployment. Organization refers to the chain of command within a unit or formation and the groups or sub-units of which it is composed. Deployment is the business of getting the unit or formation into action. "Company," "platoon," "section" are terms of organization. "A.D.S." and "C.C.P.," like "gun-area" and "defended locality," are terms of deployment. But deployment is a development of a pre-existing organization and so one sometimes speaks of "reorganization," alias "re-grouping," when this is a step in deployment. The groups in which one employs men in battle, and more particularly the groups in which one moves them towards the battle, are varied with the type of action and other circumstances and one cannot devise a permanent organization in which the distribution of personnel can be applied in detail to every action. Nevertheless a unit's organization can provide a basic grouping and chain of command which can be developed readily into the usual forms of deployment. It should also enhance the characteristics required for functional efficiency and survival in war.

To be fit for battle a field medical unit must be mobile, adaptable, well controlled, robust and possessed of a high morale. Training and discipline contribute as largely to these characteristics, but here I am concerned only with the way that organization affects them.

The obvious contribution to mobility is a sufficiency of transport—but no more. Each additional vehicle adds something to the time of getting on to and off the road and another obstacle to other units' movement. This applies particularly

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to the forward areas, where the need for mobility is greatest and where uncontrolled use of transport can have the worst results. One must be able to devote to each sub-unit or detachment just what vehicles are essential to the current movement and to hold the remainder where they are out of the way and least likely to be damaged, and that is generally as far back as practicable. Moreover, as the system of "F," "A" and "B" Echelons used by brigade troops is designed to these ends, a field ambulance must be ready to conform when under brigade command. But flexibility in transport is not enough. If one cannot move the technical staff for an A.D.S. without moving at the same time the Q.M. and M.T.O. and all their men and stores, or if one has to move twenty men when ten would suffice, it will take longer to get moving and there may be fewer suitable places to go to. Flexibility in personnel organization is equally necessary.

Flexibility in the use of men is in itself an essential if the unit is to adapt itself to the variable demands upon it. In battle a field ambulance has to find a variety of detachments for aid posts, car posts, rescue parties and so on. Even the more nearly stereotyped tasks vary in their manpower requirements. A central brigade C.C.P. requires at least two M.Os. and fifteen to twenty men, but one serving, say, the divisional administrative area needs no more than one M.O. and half a dozen men. Where an A.D.S. receives from two or three brigades in a set-piece attack one wants four or five M.Os. and about forty men, but when there is movement and casualties are light half that strength will do. A field ambulance moving in support of a brigade on an independent axis may even have to find two separate A.D.S.-forming groups. And although a field ambulance's activities fall normally into a forward collecting sphere and a rearward technical sphere, in rough or mountainous country where stretcher-bearing is a major factor, or in an assault crossing of a river, or in a withdrawal on a wide front where several routes must be covered, the one company may not be able to cover the forward task and the whole unit may have to be devoted to it.

What, then, are the features in organization that make for flexibility? *The first is that specialization should be reduced and versatility promoted.* There is a minimum practical degree of sub-unit specialization, but the greatest practicable portion of the unit should be organized in versatile general purpose groups. A unit which has one group specifically forward and another specifically rearward is less adaptable than one which has two versatile groups, both of which can take either role. That is not to say that the former arrangement, which is that of the standard field ambulance, has not other advantages, but it is less adaptable, for instance, to the occasions in which more than one company is needed for the forward task or, in a prolonged defence, to the relief of the company in the line. Another form of specialization, and one it is hard to resist in training, is the shaping of one's organization specially for any one type of manœuvre. On exercises tactical movement in M.T. receives great emphasis. In this it is an accepted drill to move a proportion of the medical troops in small groups under regimental or battalion command and one is tempted to adopt this grouping as permanent. But in war much more time and effort is spent in hard fighting in attack or defence and, much more often, a simpler, less dispersed

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disposition of the medical forces is more effective. A field ambulance working with armour can afford to be rather more stereotyped than one supporting infantry, but one cannot allow one's tactical dispositions to be dictated by any feature of one's permanent organization. The latter should be designed, therefore, not in an attempt to provide a universal grouping, but as a framework which can be elaborated to meet current needs.

Secondly, as has been mentioned, the technical and the maintenance personnel must be able to work and move independently. Those who control and co-ordinate (the unit and sub-unit headquarters) should not be tied to any one group under their command, but free to move to whatever is their key point at the time. This is simply achieved by composing a self-sufficient team for each function. But the function in which it is most important to avoid arbitrary bonds or alliances is ambulançe transport. One might have a standard numerical distribution to R.A.Ps., to C.C.Ps. in the brigade area, to the A.D.S. and so on, but this would require frequent modification, and it is quite impracticable for every individual driver to continue at the same R.A.P. or C.C.P. for even a few days of action. A pool of ambulance vehicles distributed according to requirements is the most flexible arrangement and, in one form or another, the only one that will survive several months of war. Some of the jeeps and D.Rs. are best handled on the same principle. Even with the load-carrying transport one must erase the notion that each vehicle is tied to a particular load and establish the principle of allotment as required. Nor can one keep to any fixed ratio of stretcher-bearers to other personnel unless one uses the term, as is probably best nowadays, to cover general field medical duties. When the need for cross-country stretcher-bearing arises the bearer teams must be composed for the occasion, for the requirements rest entirely on local conditions.

A field ambulance will not run through all the variations that have been mentioned in a few weeks' active service, but as they go from one type of country to another, from one sort of fighting to another, from perhaps one campaign to another, *they will meet the necessity for using their men and vehicles in several different groupings and combinations.* They will experience casualties, unexpected contingencies and periods when they are hard put to it to meet the demands upon them, and will learn that robustness against the shocks of war and adaptability go hand in hand. If they have not previously achieved this virtue they will find it thrust upon them. And it will be acquired more quickly and with fewer pains if they start with the idea that the final grouping—the composition of the appropriate medical teams and their integration with the means of conveying casualties—is done by a drill adaptable to the current battle, that is as a step in deployment, rather than as part of their permanent organization or establishment.

But mobility and flexibility will end in confusion if there is not a proper control. The part that communications play in this, although vital, is secondary. Control is acquired by a combination of organization and training. The organization is, in two words, a co-ordinated decentralization. Specified responsibilities are delegated to key officers and an appropriate group of men put under the

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command of each. Where necessary each major group undergoes a further decentralization and at each level their activities are co-ordinated by the unit and sub-unit headquarters. Before action the C.O. applies the responsibilities of each group to the action in hand by defining the extent of the task allotted to each and the points of co-ordination between them. The trained subordinate commander knows what is expected of him and the limits beyond which he must not go without sanction, and will interprete his C.O.'s will in quite unexpected circumstances with remarkable sureness.

In a field unit which is constantly on the move and which may be extended over long distances the primary delegation of responsibility must be regional. As has been said, the activities of a field ambulance usually fall into a forward and a rearward sphere. So the primary decentralization requires at least two main groups or companies.

In the rearward sphere activity centres on the A.D.S. A C.C.P.-forming detachment is often wanted too, but the need for it is not constant enough to warrant its permanent existence as a separate entity. The headquarters Section was introduced in 1941* as a detachable sub-group of the main headquarters group, but, in at least the writer's division, it fell into disuse on active service for that reason. When a detachment was wanted one struck a balance between the number of men one would have liked to put to it and the number one could spare ; nor did one use the same men each time. One could call the detachment a Headquarters Section, but it had no permanent identity as a group. The requirement then in this sphere is a medical group (trained to produce detachments as required), the maintenance group and, of course, a group headquarters to co-ordinate their activities and administration.

In the forward sphere there is greater variety in the area covered and the patterns of deployment. One cannot state a set combination of subordinate groups which would suit even the majority of occasions, but one can say that when the forward group is extended its activities usually fall into two subordinate spheres. A brigade usually advances or withdraws on one or two routes. A defensive layout may be divided by a natural feature into two parts, but it is unusual for a brigade to be given an area so divided into three. Alternatively in hilly country where tortuous roads and tracks increase the time and distance factor or where, say, the brigade straddles an obstacle, a subordinate decentralization in forward and rearward spheres may be required. In either case more than one detachment may be required in one or both sub-spheres and within each co-ordination of the detachment(s), with the movements of ambulance cars and the troops they serve as necessary. The O.C. of the forward group would seldom want to decentralize in three separate spheres. The attachment of a section to each of three battalions for an assault landing or river crossing is not an example, for here there can be no control by the field ambulance until they land and, when they do, there will be nearly always two landing places and the assault

* In a War Office directive which also introduced the three-section organization of the two forward companies of the current (1937) establishment. Both these features were incorporated in the 1942 field ambulance establishment.

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will be on two axes. The attachment of a section to each of three regiments or battalions is far from a universally applicable drill, but when it is used it is usually wise to retain some portion of the group under field ambulance control. A sounder argument for three sections would be that one often starts with two sections deployed and it is a good thing to have a reserve. Equally good arguments can be made for four sections. But the essential point that experience forced upon one was that in covering the various manœuvres of a brigade—and it may be an infantry brigade of three battalions, or an armoured brigade of three or four regiments, or a mixed armoured-infantry brigade group—one cannot be bound to any fixed system of grouping. What is wanted in the permanent organization is a simple interim grouping which can be developed readily into any of the finer subdivisions that may be required on deployment. For the reasons given, and because it is the simplest, the organization of the forward group that does this best is in two parts. The two parts would not necessarily always be equal but each could provide at least two detachments and a sub-unit headquarters for their co-ordination.

But a functional as well as a regional decentralization is required. If the C.O. is to retain control of the unit supply and M.T. affairs, the Q.M. and M.T.O. must be directly responsible to him in everything to do with their functions, and the manner in which their personnel are included in either main group and subordinate to the group commander must be carefully defined. There is no difficulty with the Q.M.'s small and constant team, but the relationships of the M.T.O. and the group commanders with the R.A.S.C. drivers are open to ambiguity and contention. If the R.A.S.C. are treated as a distinct group which is deployed in connection with the R.A.M.C. groups on the C.O.'s orders, not only are these relationships much clearer but also the C.O. has, through the M.T.O., a more direct, a more flexible and a better co-ordinated control of the unit transport. And this introduces the consideration of balance in organization. If one could organize the unit in three or four similar groups, administrative and tactical decentralization could be even and impartial. But if one group comprises a majority of the unit, perfect impartiality in administration is not in all ways easy and the tactical initiative which can be permitted to this group commander is very limited. If he is given further responsibility in personnel administration, in supply and M.T. affairs, the C.O. must restrict his initiative in them. If this restraint is not imposed by the C.O., nor voluntarily assumed by the group commander, one will get, what one has seen, a unit run by the second-in-command. However, it is better to balance one's organization so that neither a majority group nor a Pooh Bah will arise. The sizes of the groups depend mainly on the regional requirements, but a balanced delegation of responsibility allows the free use of initiative within their own spheres by the responsible officers, removes the bones of contention, and promotes co-operation between them.

A balanced grouping helps too in the development of team spirit and morale. Three or four more or less equal groups give a better play to the competitive spirit with less tendency to petty jealousies and anatagonisms than do just two groups, especially if there is much disparity between the latter. The formation of

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a R.A.S.C. group helps in this way by producing, instead of two uneven groups, three of more even size. But undoubtedly the greatest contribution to a sturdy morale that organization can make is that membership of the groups should be constant. *Stability in companionship is the one stable factor that war-time life permits and it should be studiously preserved.* There can be no permanency in the membership of groups of section size and, in a field ambulance, a company of fifty to sixty men is the smallest group that can provide it. The smaller teams can be cast and recast, but the companies must be the foundation of the unit organization. If it can also be arranged, the even distribution between the companies of hardship, danger and warlike achievement is obviously a valuable aid to morale.

And now to apply these considerations to the standard establishment of a field ambulance. This shows two main groups, the strengths being, in the Higher Establishment, as below :

(1) The "Headquarters" and with it a "Headquarters Section" which must be regarded as a detachable portion of the former. These form the rearward group : Officers 8, O.Rs. 135.

(2) A "Company," which is the forward group : Officers 5, O.Rs. 86.

The term "Headquarters" as used in the establishment covers personnel performing several different functions. There are disadvantages to this collective use of the term instead of the more usual custom of applying it specifically to the commander and those who assist him directly in the control of the unit (or sub-unit). It is proposed therefore to use the term "Headquarters" in that specific sense and to use "Headquarters Company" as the collective term for the first group. The forward group will be called "A" Company. The establishment shows a Company Headquarters and three sections in the latter, but in the Headquarters Company the subordinate groups are not defined except for the Headquarters Section, on which comment has already been made. All the vehicles, including the ambulance cars, are shown distributed down to sections, but this distribution should be taken as a "standard," but variable, allotment rather than as a permanent feature of the organization. Some elaboration of the organization given in the establishment is necessary when a unit is formed. This, along with some modifications prompted by the arguments in the foregoing pages, are outlined below.

It is proposed that a field ambulance should be organized in a Headquarters and three companies—viz., Field Ambulance Headquarters and Headquarters Company (Officers 7, O.Rs. 87), "A" Company (Officers 5, O.Rs. 56), M.T. (or R.A.S.C.) Company (Officers 1, O.Rs. 78). The strengths are, of course, subject to detail modification. In the organization of the companies the principle is that the organization takes the grouping only so far as it can be permanent or nearly so. The final subdivisions and combinations are left to the time the unit takes the field. Each company should train on a small repertoire of deployment groups which, with appropriate equipment scales, should be put on to paper in the unit's "Standing Orders, War." Further details and comments are given.

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1. Field Ambulance Headquarters

Commanding Officer, Adjutant (Captain, non-medical), R.S.M., clerks four, batmen-orderly two. D.Rs. are attached from the M.T. Company as required, as are the divisional signals wireless operators when allotted.

2. Headquarters Company

(*a*) *Company Headquarters*
O.C. Company (Major), R.S.M., orderly corporal, clerk, storeman, sanitary duty N.C.O., batman-orderly.

(*b*) *Maintenance* (*or* "*Q*") *Platoon*
Quartermaster, R.Q.M.S., dispenser (sergeant), clerk, storemen (3), equipment repairer, water-duty men (2), post corporal, batman-G.D.O., carpenter and joiner (R.E.), cooks (A.C.C.) (6).

(*c*) *Medical Platoon*
(i) Medical Section:
M.Os. 2, O.Rs. 38, including sergeants (3).
(ii) Ambulance Orderly Section:
One orderly for each ambulance car; at present scale 16.
(iii) Dental Section:
Dental Officer, O.Rs. R.A.D.C. (2), batman-G.D.O.

Man-management, care of equipment and all the things that make up company administration should be as firmly delegated to O.C. Headquarters Company as to O.C. "A" Company, and he too needs a Company Headquarters. They would have less tactical business than Company Headquarters of "A" Company, but the details of the movement and deployment of their company would be their concern. The R.S.M. has a "company" as well as a "unit" role and a place on the Company Headquarters.

The Maintenance Platoon is responsible for drawing and delivering to both companies all their supplies, including water but excluding M.T. fuel. The team is constant except for the cooks, who are for distribution as required. This undergoes some variation in and out of battle and according to detachments.

The deployment groups for the Medical Platoon should include a "Grade I" A.D.S. (allotment of personnel of the whole platoon to duties in an A.D.S.), a "Grade II" A.D.S. (the same with 20 to 25 men), and a C.C.P.-forming detachment of one M.O. and 10 to 12 men. Each ambulance orderly is paired as permanently as can be with a driver, but reliefs and replacements as necessary are found from the Medical Platoon. They bring to the otherwise rearward company a part in the more warlike activities of the unit.

3. "A" Company

(*a*) *Company Headquarters*
O.C. Company (Major), general duty M.O., Stretcher-bearer Officer (subaltern, non-medical), company staff-sergeant, clerk, storeman, batman-orderly.

(*b*) *No.* 1 *and No.* 2 *Platoon* (*each*)
M.O. i/c and O.Rs. 24, including sergeants (2) and cooks (A.C.C.) (2).

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The attached R.A.S.C. sergeant and O.Rs. become members of the Company Headquarters. The general duty M.O. and the S.B.O. on Company Headquarters are available for recce and liaison duties or as an increment to either platoon. In practice the M.O. would often not be available to the company. A field ambulance is, as often as not, deficient of one or two M.Os. and in battle this M.O. would often be required for duty with Headquarters Company. The two-platoon organization eases the problem of continuity in the command of the sub-units. With one section per M.O. on the company establishment it is impossible.

The practised deployment groups for this company would include a "Grade I" C.C.P. employing a whole platoon and "Grade II" C.C.P.-forming detachments or "sections" of half-platoon strength with alternative lorry-borne, jeep-borne and man-pack equipment scales. The M.O. in command, his senior sergeant and the attached R.A.S.C. corporal constitute a Platoon Headquarters to whom co-ordination in their own sphere of action can be delegated when this is desirable. A company grouping in two sections per platoon might serve as standard for an armoured brigade unit or with infantry for, for instance, a tactical move in M.T. An establishment would have to show the two platoons as equal, but in action one might often increase one at the expense of the other.

4. M.T. (or R.A.S.C.) Company

(a) *M.T. Headquarters*
M.T.O. (Captain, R.A.S.C.), C.S.M., drivers for clerical duties (2), orderly corporal, D.Rs. (7).

(b) *Fitters (or) Repairs Section*
Vehicle mechanics (3), electrician, Class I drivers (4) (three as assistant mechanics, one as storeman).

(c) *Ambulance Car Platoon*
Corporals (2) and drivers for ambulance cars (16), jeeps (4), and the T.C.V. lorry.

(d) *"G.T." Platoon*
No. 1 Section: General transport for Headquarters and Headquarters Company (including one jeep for the C.O.).
No. 2 Section: G.T. vehicles for "A" Company (including two jeeps for "A" Company Headquarters).

The ambulance cars are allotted numerically by the C.O. to R.A.Ps., "A" Company and Headquarters Company, as occasion demands. The drivers are named by the M.T.O., who also arranges what reliefs and replacements may be necessary. By the end of an action many who were forward will be back and vice versa. The other vehicles in this platoon are those which have a dual role, ambulance or general purpose, and which are best handled in the same way. With the D.Rs. on M.T. Headquarters similarly treated, there can be a standard distribution of the other vehicles which, under normal road conditions, would be sufficiently nearly constant for the two G.T. sections to be a permanent feature. Nevertheless there would have to be some variation in membership to meet casualties and the conditions which limit the use of transport in the forward

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areas. One might put part or the whole of "A" Company on to a jeep and 15-cwt. truck scale.

The M.T. Headquarters and Fitters' Section, with any vehicles in reserve or under repair, together with the Maintenance Platoon, form on deployment an Administrative Echelon which can be moved and staged with the divisional administrative units, or with a brigaded "B" (or "A2") Echelon, or alone independently of the Medical Platoon. The Medical and Headquarters group is thereby rendered more mobile and, having only twelve to fifteen vehicles, could claim a more forward place in a brigade column. "A" Company might hold one form for long or short periods. A sectional grouping would be held over a phase of rapid movement; a simpler form with occasional detachments of small parties would prevail in less mobile conditions.

The organization proposed above preserves the main features of the standard arrangement—namely, the combination of a forward collecting group with a rearward largely specialized technical group. It has been hinted that there would be advantages in having, instead, two versatile groups, both of which could take either role, and in the writer's division such an organization was evolved in the latter part of the Italian campaign. In this there were: Headquarters Company (Unit Headquarters, Maintenance group, ambulance orderlies, and a small medical section); two identical medical and general purpose companies, called "A" and "B"; a R.A.S.C. Company. "A" and "B" Companies each had a Company Headquarters and was handled in two groups. There was no fixed establishment for these, their strengths being adjusted to the occasion. They could be used "two-up" or, as was usual, one as Medical group forming the A.D.S. or a central brigade C.C.P., and the other as a Light or Mobile group responsible for any forward or collateral tasks. When the company was in the rearward role the Medical group absorbed most of the men, but in the forward role, supporting the brigade, the Light group was usually the stronger. We had no divisional F.D.S. and the field ambulances held the division's light sick, either each for its own brigade or in one company of one field ambulance. The main advantages of this method of organization were its great adaptability and the alteration between battle experience and medical work, which was very much liked by officers and men and contributed greatly to their enthusiasm and morale. With a new unit the main disadvantage would be that it would take longer to bring both companies to efficiency in their tactical training, for this can only be achieved by co-operation with the parent brigade on exercises. The orthodox arrangement of one forward and one backward company has a great advantage in this respect, but the disadvantages inherent in group specialization would appear after a hard time in battle. Conversely the advantages of this unorthodox, unspecialized organization only appeared after such experience. However, this scheme of organization has been described only to demonstrate that there is more than one practical solution to organization problems.

An attempt has been made to relate the serviceable characteristics of a unit to certain features in its organization, and a scheme embodying these within the general outline of the standard field ambulance has been described in some,

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but not complete, detail. The two-platoon organization of the forward ("A") Company might be regarded as unorthodox, and so might the R.A.S.C. Company, but the other features are common in divisional units. Even the ambulance platoon is in a small way a counterpart to the Support Company of an infantry battalion. A plea has been made for distinction between the normal day-to-day organization which obviously must be constant and the organization, or grouping, on deployment which must be adapted to the current action.

My thanks are due to Major-General R. D. Cameron, *C.B.E.*, *M.C.*, K.H.S., Director of Medical Services, Rhine Army, for permission to forward this article.

A METHOD OF MOUNTING BIOLOGICAL SPECIMENS IN PLASTIC

BY

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THE advantages of mounting biological specimens in plastic are very apparent, especially in preparing demonstration specimens for large classes. Even the most delicate of insects, when embedded in a transparent block of plastic, can be passed round the class without getting damaged. The use of such specimens is not limited to naked eye demonstration alone. Specimens may be viewed under a dissecting microscope and even with the 2/3 objective on an ordinary microscope.

The method in use at the Army School of Health is very simple and can be employed by anyone who has the slightest knowledge of biological mounting techniques.

The plastic used for embedding is "Marco S.B. 26 C Resin."

The kit consists of two solutions ; the more viscous resin which is weighed out in grams, and the thinner hardener which is added at the rate of three drops per gram of resin by means of the special pipette provided. This embedding kit is obtainable from E. M. Cromwell & Co. Ltd., Galloway Road, Rye Street, Bishop's Stortford, Herts. (price 25s.).

Specimens can be prepared for mounting in several ways according to the effect required.

Insects may be mounted dry, after having been set in the normal way, or they may be dehydrated and cleared in ether followed by immersion in the prepolymer of the plastic. Larvæ, such as those of mosquitoes, may be fixed in formal-saline or corrosive sublimate. They are then washed and dried for a few minutes on filter paper and mounted as usual.

The method of mounting is as follows :

A glass mould of the required size is prepared by sticking pieces of micro-

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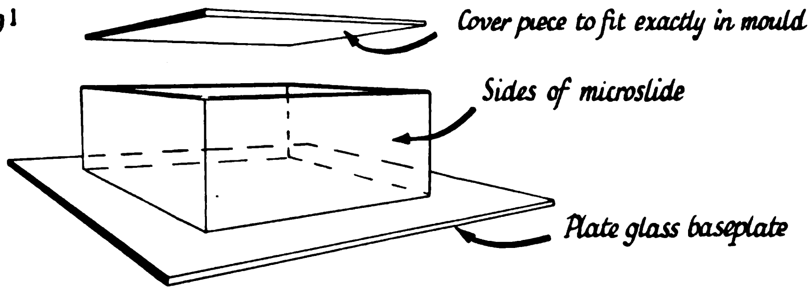
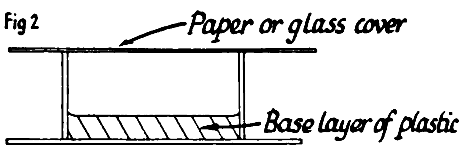
slide on a glass baseplate with a suitable glass cement. A second layer of cement should be run round the outside to ensure that the mould is watertight. A piece of slide is then cut to fix exactly in the mould for a cover-piece (Fig. 1).

Fig 1



Enough plastic is mixed to cover the bottom of the mould to a depth of $\frac{1}{8}$ inch. The mould is then covered with a piece of paper or glass to exclude dust and the plastic is allowed to set (Fig. 2). Setting occurs in about three-quarters to two hours, depending on the room temperature and more particularly sunlight. The speed of hardening may be accelerated, if desired, by the application of gentle heat.

Fig 2



When the first layer has set a second layer is poured to cover approximately half the specimen that is to be mounted. The specimen is then placed in the plastic carefully so that no air is trapped between the appendages. At this stage it is convenient to put in any data required, by writing on a piece of celluloid, e.g., X-ray film, with Indian ink. Care should be taken that the specimen does not move out of position (Fig. 3).

When the second layer has set a third layer is poured to cover the specimen completely (Fig. 4).

Fig 3

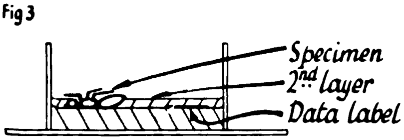
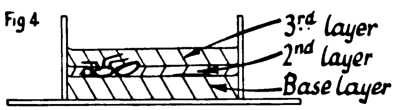


Fig 4



A very thin fourth layer is now added and the glass cover piece, which must be perfectly clean, is lowered carefully into position. Care should be taken that enough of the plastic oozes above the glass to ensure that no air is sucked under as the plastic contracts (Fig. 5).

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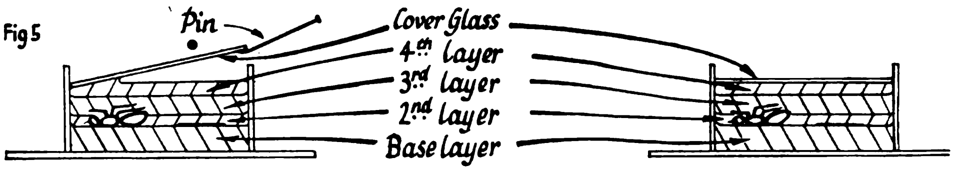
The block is left overnight to harden and the mould is then carefully broken away. First the side plates are broken away and then the baseplate. The cover glass may then be eased off. The rough edges may be trimmed with fine sandpaper, but care should be taken not to scratch the polished surface.

Fig 5



A number of specimens have been successfully embedded at the Army School of Health, including Tabanids, and Chrysops, Simuliidæ, Rhodnius, mosquito larvæ and adults, and various ticks.

This method of preserving biological specimens, especially insects, has a great future. The mounts are virtually unbreakable and everlasting.

I am indebted to Colonel H. E. Knott, *O.B.E.*, M.D., for his encouragement and permission to publish this paper.

HYPERTHERMY IN THE BRITISH ARMY

BY

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(*Adviser in Venereology to the War Office*)

Introduction

Artificially induced fever was used for a number of years in the medical treatment of a variety of diseases, but it had a particular application to certain venereal and allied conditions.

Fever can be induced artificially in man by several methods, but the two most favoured for practical purposes are, first, the physical method which employs special appliances such as the Kettering hypertherm and the inductotherm; and, second, the injection of pyrogens such as triple typhoid (T.A.B.) or *B. coli* vaccine, products of milk protein, or the living parasite of malarial fever. Before the war, facilities for inducing fever by physical means were available in many hospitals in the United States, but in this country only a few centres possessed the necessary apparatus.

When the war began, the method of inducing fever commonly used in the Service was the intravenous injection of vaccine, of which T.A.B. vaccine was most easily available and found most favour. With general mobilization, the increase in the number of serving personnel was accompanied by an even greater increase in the incidence of venereal diseases. The early success of the sulphonamides in the treatment of gonorrhœa and its complications was not maintained, and Military Hospitals, both at home and abroad, admitted for treatment

increasing numbers of resistant cases of gonorrhœa. In some theatres of war these numbers grew to alarming proportions.

In order to deal with this problem, a special unit for high fever treatment induced by mechanical means, using the Kettering Hypertherm, was formed at the Royal Victoria Hospital, Netley, in 1941, under the direction of Lieut.-Colonel A. J. King, R.A.M.C. This was made possible by the fact that Lieut.-Colonel King had had previous experience of this type of treatment before the war, when a Kettering hypertherm had been used in the Department of Physical Medicine of the London Hospital. Lieut.-Colonel King had also made a special visit to the United States in 1937 to study the technique of this treatment at various centres.

The Royal Army Medical Corps was able to obtain the machine previously used at the London Hospital and an additional more up-to-date machine from the United States, which had beeen acquired in 1939 but had not been used. As special nursing skill was most essential, the Hypertherm Unit was most fortunate in obtaining temporarily the services of Sister Hilda Richardson of the London Hospital, who was able, over a period of three months, to train a number of Nursing Sisters of the Q.A.I.M.N.S.

There were many practical difficulties to overcome, not the least of which were the inexperience of most of those concerned with the treatment and the constant changes of personnel which were made necessary by the exigencies of the Service ; and, unfortunately, there were two fatalities in the early days. But, with the aid of a special research team and by modifying and improving technique as experience indicated, problems were solved and difficulties overcome. Further improvements followed a visit by Lieut.-Colonel King to the United States during January to April, 1943, when he was able to obtain first-hand information from the Intensive Treatment Centre of the United States Public Health Service in Chicago and from other leading centres of fever therapy.

Difficulties were experienced in obtaining accurate readings of rectal temperature at the high temperatures required for effective treatment, both with clinical thermometers and with resistance thermometers which had been constructed for the purpose. Advice was therefore sought from the National Physical Laboratory and help of the most practical kind was provided by Mr. J. A. Hall of the Laboratory. In the Laboratory report on the subject it was stated that the normal requirements for approval of a clinical thermometer by the National Physical Laboratory included the stipulation that it should not be in error by more than $\pm 0.2°$ F. at temperatures below 106° F. or $\pm 0.3°$ F. at or above 106° F., while the test was such that a thermometer would be approved provided its readings were reproducible to $\pm 0.1°$ F. If it was desired to control the patient's temperature between the limits of 105.8° and 106.2°, it was therefore not sufficient merely to use a thermometer bearing the monogram of the National Physical Laboratory. It was essential that a table of corrections should be used and desirable for greater accuracy that thermometers should be selected by special test. It was also necessary that thermometers should be re-tested from time to time because mercury thermometers invariably showed a certain secular change in their

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readings. The interval suggested for re-testing was three months after the original test, with repetitions at the end of a year and thereafter at yearly intervals. Special two-minute rectal clinical thermometers ranged from 98° to 108° F. were obtained from Messrs. A. C. Cossor & Sons, and these were specially tested at the Laboratory and re-tested from time to time. In addition, in 1944 Mr. Hall devised a nickel resistance thermometer for clinical use, together with a portable mains-operated resistance bridge of the Callender Griffiths type. With this instrument, which proved in practice to be both reliable and accurate, he was able to obtain an accuracy of $\pm 0.02°$ F. Tests of the resistance thermometers which had been used earlier showed that they could not be relied upon, under the best conditions, to give an accuracy of better than 0.1° F., and this accuracy was dependent upon exact maintenance of the correct battery current which might vary as the result of faulty contacts in the circuit; one of these thermometers was liable to sudden changes in reading of an unpredictable character.

There is no doubt that the work which was done by Mr. Hall considerably increased the safety and efficiency of the treatment.

In 1943 the Hyperthermy Unit moved into E Block at Netley, with some improvement in facilities; and in 1944, when Netley was taken over by the forces of the United States of America, the Unit moved again, reopening at the Royal Victoria Hospital, Westbury, with two new hypertherms, one of which replaced the original machine and the other added to the resources of the Department.

In the summer of 1945 the Hospital returned to Netley and the Hyperthermy Department was once again reopened in the Families Hospital adjacent to the Main Block.

In 1945 Lieut.-Colonel King was demobilized. By this time the medical and nursing staff of the Department were experienced and efficient, so that the work which he started and had directed was continued without interruption. At first the Unit remained at Netley under the direction of Lieut.-Colonel H. Bell and then of the author; and during the year which followed the Department worked at full capacity. In September, 1946, the Unit moved from Netley to the new Connaught Hospital at Hindhead, reopening with three hypertherms. By this time the effects of general demobilization were becoming apparent and the number of patients requiring this treatment became progressively fewer. It was rarely necessary to use more than two cabinets at any one time. After another year it became obvious that it would be uneconomical to keep a skilled staff of doctors and nursing officers solely employed for the benefit of so few patients. Finally, in March, 1949, the hypertherms were stored in the Command Medical Stores at Ludgershall, where they remain.

Brief Mechanical Description of the Kettering Hypertherm

The Kettering hypertherm was devised by Simpson, Kislig and Sittler in 1933, and modified in detail over a period of years. It is a simple mechanical device, consisting of a cabinet which is divided into an upper and lower compartment by a platform. The lower part contains a water-pan which is fed from a large

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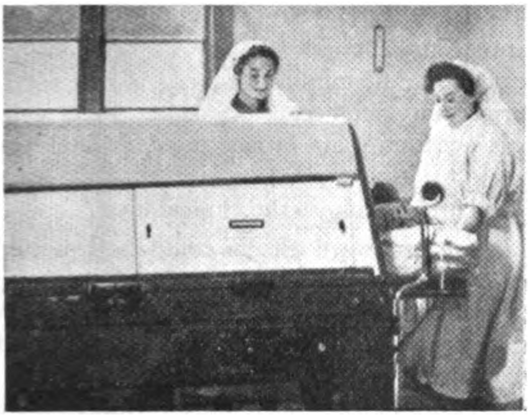
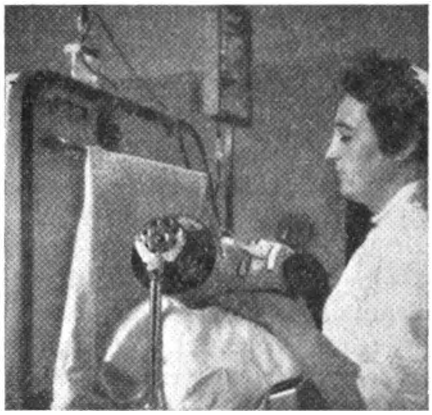
bottle fixed in an inverted position on the outside of the cabinet. The water in the pan is heated electrically by an element which is controlled by a rheostat, and this can be regulated by a dial on the outside of the machine. An electric fan circulates the heated water vapour throughout the cabinet. The patient lies on a mattress on the platform, naked except for a loose towel covering his loins. When the lid of the cabinet is closed, only his head remains outside. During the treatment he is surrounded by heated atmosphere saturated with moisture and so cannot lose heat by evaporation of sweat except from the head and face. As a result the body temperature rises to the required maximum and can then be maintained at a steady level by manipulation of the cabinet controls.

The medical aspects of this treatment during the period 1941 to 1943 were dealt with in detail in papers by King, Williams and Nicol (1943) and by Wallace and Bushby (1943); the nursing technique was described by Nursing Officer Pegg (1943).





Types of Cases Treated—Fever Levels and Duration of Treatments

The following were the medical conditions which were treated by hyperthermy in this series :

(1) Gonorrhœa resistant to chemotherapy.

(2) "Non-specific" urethritis resistant to chemotherapy.

(3) Gonococcal arthritis and "non-specific" arthritis (including so-called "Reiter's Syndrome").

(4) Gonococcal and non-specific iridocyclitis.

(5) Acute and sub-acute salpingitis.

(6) Severe resistant infestation by the *Trichomonas vaginalis.*

(7) Congenital syphilis with interstitial keratitis.

(8) Neurosyphilis of all types.

It was found that one session of fever consisting of eight hours at 106° F., rectal temperature, usually cured resistant gonorrhœa and improved the symptoms caused by non-specific urethritis. In these conditions it was usual to

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administer to the patient sulphathiazole during the twenty-four to ten hours preceding fever.

Similar levels of fever were employed for the same periods for patients suffering from arthritis, but more than one session was often necessary in order to obtain the best results. If further sessions were necessary, they were given at intervals of not less than one week.

Standard fever therapy for cases of resistant syphilis and neuro-syphilis was eight to ten weekly sessions of fever, each consisting of five or six hours at 105.5°F. At the same time injections of arsenicals and bismuth were given as follows: 0.2 gm. of bismuth was injected intramuscularly before treatment commenced, and 0.45 gm. of neoarsphenamine was given intravenously at the height of fever.

A detailed account of the technique of hyperthermy is not appropriate here. It is necessary, however, to mention certain possible complications of treatment and methods by which they could be alleviated.

These complications were usually associated with tissue anoxia, especially in those patients treated for eight hours at 106° F. They were as follows:

(1) Drowsiness progressing by stupor and coma.
(2) Rapid shallow respirations up to 60 to the minute.
(3) Restlessness followed by delirium and violence.
(4) Peripheral circulatory collapse occurring late in treatment or after the end of treatment.
(5) Sub-clinical jaundice sometimes progressing to the clinical level.

It was found by experience that these untoward effects could be lessened (1) by preventing the rectal temperature from rising above 106° F., (2) by continuous oxygen or oxygen and CO_2 mixture (5 to 7 per cent. of CO_2) administered through a B.L.B. mask or nasal catheter and continued during the period of recovery from fever, for one hour or more.

Certain definite indications for discontinuing treatment were formulated by experience:

(1) Uncontrolled rise in body temperature above 106° F.
(2) Pulse rate above 160 to the minute or irregularity of the pulse, unaffected by the administration of intravenous saline infusion.
(3) Systolic blood pressure below 100 millimetres of mercury unaffected by intravenous saline infusion.
(4) Persistent mental symptoms of uncontrolled hysteria.
(5) Stupor with incontinence of urine and fæces, which might be associated with facial pallor superimposed on cyanosis.
(6) Persistent vomiting in spite of cessation of fluids by mouth and substitution of intravenous fluids.
(7) Tetany uncontrolled by oxygen and CO_2 inhalations or by intravenous calcium gluconate.

It should be emphasized that none of the above-mentioned complications is common and the great majority of fever sessions were completed without major incident. Such complications became less frequent as experience increased.

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The total numbers of patients treated and the treatments which they received are shown in the following table :

	No. of Patients Treated	No. of Treatments Given
Nov., 1941, to Sept., 1945	1,200	2,000
Oct., 1945, to Dec., 1948	494	929
Total	1,694	2,929

No. of deaths 2
Mortality rate per treatment 0.06 per cent.

Results

Gonorrhœa.—King, Williams and Nicol (1943), working in the Department, treated 319 patients suffering from sulphonamide-resistant gonorrhœa ; 240 received one session of fever at 106° F. for eight hours. Ninety per cent. of the patients promptly recovered.

Non-gonococcal Urethritis.—Forty-seven patients were treated with one eight-hour session. In 30 cases the results were immediately successful.

Arthritis.—Details of the results obtained in the treatment of arthritis were published by King, Williams, Nicol and Loudon (1946). One hundred and twenty-nine patients were treated ; of these 49 had gonorrhœa, 32 gave a past history of gonorrhœa, while 48 had arthritis complicating non-specific urethritis. Although this number included some patients who had received no other treatment, the majority had failed to respond to other methods of treatment, including fever induced by intravenous vaccine—

18 received three or more full sessions of treatment ;
35 received two or more full sessions of treatment ;
65 received one session only ;
11 did not complete the session.

Immediate benefit, as shown by decrease in pain, increase in movement and feeling of well-being, was experienced by all patients without exception. In some cases there was some recurrence of symptoms of moderate degree within a few days. Immediate success was obtained in 30 out of the 46 patients in the group in which the gonococcus was found, which was a higher proportion than in those with a past history of gonorrhœa (17 out of 32) or in the group with non-specific infection (24 out of 47). No records were available of three cases in the first group and one case in the last. From the point of view of military service, the results were analysed as follows :

57 per cent. were fit enough to return to their unit without change of medical category ;
17 per cent. were returned to their unit with a temporarily reduced medical category ;
26 per cent. were discharged from the service as medically unfit.

The end results in 118 patients whose later history was ascertained by follow-up were as follows :

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Continued military service or made a good recovery in civilian life :

Gonococcal cases	33 out of 42
Post-gonococcal cases	22 out of 30
"Non-specific" cases	30 out of 46

Syphilis.—The value of fever for the treatment of spyhilis is not so readily assessed. It is necessary to follow-up patients for a long period of time and study the results of tests performed on the blood and the cerebro-spinal fluid before an opinion as to cure can be given.

Regarding certain patients with interstitial keratitis or signs of tabes dorsalis or of general paralysis, it was possible to form impressions.

SPECIMEN TEMPERATURE CHART

Rank—Pte. Name—SNOOKS Age—23 years Diagnosis—Neuro-Syphilis, 5th Treatment

Date	Hour	Temp.	Pulse	Notes	BP.	Fluids, Drugs, etc.	Treatment Remarks	Urine Passed
19/8/47	a.m. 6.45	99^{8}	98	T of A $\frac{124}{116}$	$\frac{160}{120}$	I.M. Bismuth 0.2 grm.	Placed in cabinet. Towels in position.	
	7.0	99^{8}	116	C $\frac{116}{80}$ D			0.2 CO_2 through B.L.B. mask.	
	7.15	101^{8}	120	C $\frac{116}{80}$ D		H.I. Alopon gr. 1/6.	Pulse rate increasing.	
	7.30	103^{4}	116	C $\frac{117}{60}$ D		0.6 per cent. Sodium Chlor., 200 c.c.	Volume good. Slightly cyanosed.	
	7.45	105^{0}	112	C $\frac{114}{60}$ D	$\frac{146}{60}$	0.6 per cent. Sodium Chlor., 200 c.c.	Fidgety. Fans to head.	
	8.0	105^{4}	114	C $\frac{110}{80}$ D		Commenced I.V.I. Saline 1st bottle.	Changed to 0.2.	
	8.15	105^{6}	108	C $\frac{110}{60}$ D		0.6 per cent. Sodium Chlor. 200 c.c.	Restless.	
	8.30	105^{6}	112	C $\frac{109}{60}$ D			Fidgety.	
	8.45	105^{0}	114	C $\frac{108}{60}$ D		0.6 per cent. Sodium Chlor., 200 c.c.		
	9.0	105^{6}	112	C $\frac{108}{60}$ D	$\frac{156}{60}$			
	9.15	105^{6}	116	C $\frac{107}{60}$ D		0.6 per cent. Sodium Chlor., 200 c.c.	Changed to nasal catheter.	
	9.30	105^{7}	112	C $\frac{107}{60}$ D			Total oral intake 1,000 c.c.	
	9.45	105^{7}	112	C $\frac{107}{60}$ D		0.6 per cent. Sodium Chlor., 200 c.c.	Fidgety.	
	10.0	105^{6}	110	C $\frac{107}{60}$ D	$\frac{156}{70}$		Pulse rate and volume satisfactory.	

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Date	Hour	Temp.	Pulse	Notes	BP.	Fluids, Drugs, etc.	Treatment Remarks	Urine Passed
	a.m. 10.15	105^{6}	112	C 107 / D 60		I.V. Nab. .45 grm., 0.6 per cent. Sodium Chlor., 200 c.c.	I.V. Needle reinserted due to fluid in tissue. Needle blocked.	
	10.30	105^{6}	114	C 106 / D 60				
	10.45	105^{6}	116	C 106 / D 60		0.6 per cent. Sodium Chlor., 200 c.c.	Very restless.	
	11.0	105^{6}	124	C 106 / D 60	156 / 70	H.I. Alopon gr. 1/6.	Ice to head.	
	11.15	105^{6}	116	C 107 / D 60		0.6 per cent. Sodium Chlor., 200 c.c.	Quieter.	
	11.30	105^{7}	122	C 106 / D 60			Resting quietly.	
	11.45	105^{6}	124	C 106 / D 60		0.6 per cent. Sodium Chlor., 200 c.c.	Total oral intake 2,000 c.c.	
	Noon 12.0	105^{4}	122	C 106 / D 60			Restless.	20 c.c.
	p.m. 12.15	105^{7}	124	C 107 / D 60			Remains extremely restless.	
	12.30	105^{8}	128	C 108 / D 60	128 / 80	0.6 per cent. Sodium Chlor., 200 c.c.		
	12.45	105^{7}	126	C 107 / D 60			Quieter.	
	1.0	105^{6}	120	C 106 / D 60			Resting quietly.	
	1.15	105^{6}	112	C 106 / D 60	130 / 60	0.6 per cent. Sodium Chlor., 200 c.c.		
	1.30	105^{6}	116	C 107 / D 60			Total oral intake, 2,400 c.c.	20 c.c.
	1.45	105^{6}	112	C 107 / D 60	136 / 60		Cabinet opened. 0.2 and CO_2 through B.L.B. mask.	
	2.0	105^{6}	114	/28				
	2.15	104	118	/26				
	2.30	102^{8}	116	/26			Bed Bathed.	
	2.45	101^{8}	120	/28	126 / 60		Returned to bed.	

Total I.V. Glucose Saline	500 c.c.
Total oral intake	2,400 c.c.
Total urine passed	40 c.c.
Total vomited	Nil

If fever hastened the resolution of interstitial keratitis, the effect was no more than slight.

In tabes, symptoms were sometimes markedly improved. A few patients with congenital or acquired general paralysis received this treatment, but no marked clinical improvement was noted.

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Details of cases of these types to which this treatment was given are as follows:

September, 1944—*December*, 1947

Neuro-syphilis (Acquired)	
Asymptomatic neuro-syphilis	37
Acute syphilitic meningitis	1
Meningo-vascular syphilis	11
Tabes	3
General paralysis	3
Neuro-syphilis (Congenital), including one with tabes and one with tabo-paresis	14
Early Syphilis	3
Sero-resistant latent syphilis	7
Congenital syphilis, including four with interstitial keratitis ...	6

The Future of Hyperthermy

The use of antibiotics has completely changed the treatment of the venereal diseases by shortening the course of the infections and diminishing the incidence of complications. It may well be, too, that when A.C.T.H. (Adrenocorticotropic Hormone) or cortisone are more widely available, the indications for hyperthermy may be still further limited. It appears that few of the indications for this treatment which existed in 1941 remain ; and it seems probable that hyperthermy on a large scale will not be necessary as a military requirement in the future.

There is no doubt, however, that the R.A.M.C. Hyperthermy Department served a very important role in the care and treatment of the sick, not only of the British Services but also of many of our Allies and of prisoners of war. There must be many who have cause to thank the "Hot Box" for their health today. It is only right to record here a tribute to all the medical officers, nursing sisters and orderlies who worked in the Department from time to time. Their loyalty and devotion to duty, despite most strenuous and exacting conditions, contributed to making this difficult venture a success.

Acknowledgment

Thanks are due to Lieut.-Colonel A. J. King, R.A.M.C. (T.A.R.O.), and to Major C. S. Nicol, R.A.M.C. (T.A.), for their help and advice during the writing of this paper.

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

III.—URINARY AGGLUTININS IN UNINOCULATED CHRONIC URINARY CARRIERS

BY

Colonel G. T. L. ARCHER

AND

Surgeon Commander W. SLOAN MILLER, R.N.

(Of the Central Laboratory, Middle East Land Forces, and U.S. Naval Medical Research Unit No. 3, Cairo, respectively)

IT HAS been shown in a previous paper (Archer *et al*, 1952) that homologous H-specific agglutinins are generally present in the urine of chronic urinary typhoid and paratyphoid carriers in a TAB vaccinated Egyptian population having a high incidence of schistosomiasis.

Heterologous urinary agglutinins were also sometimes found in such carriers, as were agglutinins in the urine of non-carriers. Homologous agglutinins were rare for *Salm. paratyphi C* in transient carriers of that species. *Salm. paratyphi C* is absent from the vaccine used to inoculate these people.

It was suggested that such homologous agglutinins either resulted from the plasma leak of schistosomal bladder lesions or were locally produced. Conclusive evidence in support of this latter hypothesis has since been obtained by Naylor and Caldwell (1952). It was further suggested that a primary stimulus, as found necessary for local antibody production by Oakley *et al* (1949, 1951), might be required. Previous inoculation with TAB vaccine could possibly stimulate the early appearance of urinary agglutinins in carriers, although the *chronic* carrier state might of itself provide effective stimulation.

It thus seemed desirable to examine urine specimens from chronic urinary carriers known to be free of artificial immunization by anti-typhoid inoculation. For this purpose samples of urine were collected from four chronic urinary typhoid carriers and from one chronic urinary *Salm. dublin* carrier, none of whom had had injections for typhoid prophylaxis. Bacteriological examination of urine and stool specimens from these cases had been made at approximately monthly intervals for the preceding two years, and serological examination of blood samples rather less regularly. At almost every examination the infecting organism was present in the urine, usually in large numbers ; on no occasion was it recovered from the fæces. In all five cases there was unequivocal evidence of urinary schistosomiasis. The total duration of the carrier state as estimated from their clinical histories varied between three and eight years.

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The urine samples examined were mostly early morning specimens, but in some instances serial samples were collected later on the same day. They were obtained during the course of a ten-day period of chloramphenicol therapy or in the subsequent week, and all were bacteriologically sterile when fresh.

Methods

The H-specific antigens used were as follows: *Salm. paratyphi A* (a), *Salm. paratyphi B* (b), *Salm. paratyphi C* (c), *Salm. typhi* (d); a formalinized broth suspension of the patient's own organism was used for testing the serum of the *Salm. dublin* carrier (. . g, p . .) and a suspension of *Salm. enteriditis* (. . g, m . .) for his urine.

In testing for O agglutinins a *Salm. typhi* O suspension (IX, XII . .) was used, and Bhatnagar's strain Vi I for Vi agglutination.

Tests for H agglutinins in urine were carried out as previously described, 1/2 being usually the lowest dilution used. These tests were read independently by two or three observers; the last generally using the criterion of a demonstrably floccular deposit overnight; this usually gave slightly lower readings than immediate observation on removal from the water bath. Finer floccules, though clearly visible under the latter conditions, apparently disintegrate on attempted resuspension.

Tests for O agglutinins in urine were made at 55° C. and 37° C., and for Vi agglutinins at the latter temperature. In each case the urine was first used undiluted, one drop of concentrated bacterial suspension being added.

The serological tests were made with standard reagents supplied through the courtesy of Lieut.-Colonel Bensted, Director of the Central Public Health Laboratory (see Bensted, 1951). Doubling saline dilutions were used from 1/5 to an end point. The H and O agglutination tests were finally read after twenty-four hours at 52° C., and the Vi after two hours at 37° C. and twenty-two hours at 4° C. The H agglutinin titres were read naked eye, and the O and Vi with the aid of a concave microscope mirror.

Results

The results of the agglutination tests are summarized in the table. It will be noted that relatively high titre H-specific agglutinins are present in the sera of all five cases, homologous with the infecting organism. Heterologous H-specific agglutinin is present in the serum of only one case (Case 4, "a" agglutinin) in low titre.

Heterologous H-specific agglutinins were found in none of the 14 specimens of urine examined for them. Homologous H-specific agglutinins are present in 45 of the 50 urine specimens examined. In only a single case was their presence inconstant (Case 1), where half of the samples examined were negative by the technique employed. However, homologous H-specific agglutinin was demonstrated in one "negative" sample from this case, in a few experiments where drops of concentrated *Salm. typhi* H suspension were added to the undiluted urine.

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TABLE SHOWING THE SERUM AND URINE AGGLUTININ TITRES (EXPRESSED AS RECIPROCAL OF HIGHEST REACTING DILUTION) OF FOUR CHRONIC URINARY *Salm. typhi* CARRIERS (CASES 1–4) AND ONE CHRONIC URINARY *Salm. dublin* CARRIER (CASE 5)

Case No.	Urine numbers indicate individual samples tested	Agglutinin Titre						
		H—specific					O	Vi
		a	b	c	d	g, m/p . . *	IX, XII . .	
	Serum	<5	<5	<5	320		40	20
1	Urines 2	<2	<2	<2	2			
	1	<2	<2	<2	<2			
	3				2			
	4				<2			
	Total 10		(Geometric mean 2.0)					
	Serum	<5	<5	<5	640		640	320
2	Urines 3	<2	<2	<2	4			
	7				4			
	2				10			
	Total 12		(Geometric mean 5.5)					
	Serum	<5	<5	<5	160		80	5tr
3	Urines 1	<2	<2	<2	4			
	1	<2	<2	<2	10tr			
	5				4			
	1				10			
	Total 8		(Geometric mean 6.1)					
	Serum	10	<5	<5	640		320	160
4	Urines 1	<2	<2	<2	4			
	2	<2	<2	<2	10tr			
	4				10			
	1				10tr			
	Total 8		(Geometric mean 9.5)					
	Serum	<5	<5	<5	<5	2560	80	5
5	Urines 1	<2	<2	<2	<2	20tr		
	2	<2	<2	<2	<2	20		
	3					10		
	4					20		
	2					20tr		
	Total 12				(Geometric mean 18.0)			

* Formalinized broth suspensions of *Salm. dublin* (patient's own strain, . . g, p . .) were used as antigen for the serum tests, and of *Salm. enteriditis* (. . g, m . .) for the urines.

In calculating the geometric mean no correction has been made for "trace" readings. If these are assessed at 70 *per cent. standard the means for cases* 3, 4 *and* 5 *become* 5.5, 8.8 *and* 16.5 *respectively.*

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No urinary O agglutinin was detected in any of three specimens from each of Cases 2, 3 and 4, either diluted or undiluted, despite its presence in their sera. Nor was Vi agglutinin detected in two urine specimens from Case 2 and one from Case 4, notwithstanding the relatively high serological Vi titres in these two cases.

Of 11 instances where the urinary H agglutinin titre was compared between two samples from the same case collected two to three hours apart, between 0730 and 1200 hrs., the later specimen showed a slightly higher titre on six occasions, but was never lower.

Two specimens of urine from Case 3 showed non-specific flocculation or turbidity and are not included in the results.

Discussion

The source of the urinary antibody demonstrated in these cases is a matter of some interest. In a larger group of uninoculated chronic urinary carriers which have been followed up for almost three years (W. S. M.), homologous H-specific agglutinins have been constantly present in their blood. Although wide variations occur in agglutinin level between one case and another, the serological titre generally remains at a fairly constant level in any given case over periods of many weeks. Blood is frequently found in the urine in these cases, most of whom suffer from urinary schistosomiasis, and it might therefore be supposed that the urinary agglutinin results from simple mechanical leakage of blood.

This is not the case, however, because microscopical examination of the urinary deposits from the specimens here considered showed all but two of them to be free of red cells, and it is known that this test will reveal small traces of blood. Both hæmaturia specimens were from Case 5, and in each there was a heavy deposit of red cells clearly visible naked eye. The H titres for these two samples were 1/20 and 1/20 trace respectively, no higher than that found in seven other urine samples from the same patient which were entirely free of macroscopic and microscopic evidence of blood. The highest ratio of urinary to serological antibody level, as measured by H-specific agglutinin titre, occurs in Case 3. Urinary agglutinins were demonstrated twice in this case in specimens free of blood at a dilution of 1/10, but the corresponding serological titre has never exceeded 1/160. If this is a valid measure of antibody level, and on the hypothesis that the urinary antibody derives entirely from vesical bleeding, it would mean the addition of approximately 1 part of blood to 16 of urine, which is absurd.

In any given case there is a general consistency in urinary agglutinin titre between samples collected on different days over a ten-day period, although considerable variations occur between one case and another. For example, in Case 1 the urinary titre never exceeded 1/2, whereas in Case 5 it was consistently 1/10 or higher. Although this latter patient had the highest serological titre and consistently gave the highest urinary titre, it should be noted that the antigen used here differs from that in the other cases. This apparent correlation might

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therefore be due merely to the better sensitivity of the bacterial suspension used, as compared with that used in the other cases.

There is no other correlation between urine and serum antibody level as measured by agglutinin titre. The following list (titre expressed as reciprocal) shows this :

Case No.	*Geometric Mean* URINE *H-antibody Titre*	*Homologous* SERUM *H-antibody Titre*	*Ratio Urine/ Serum Titre*
1	2.0 (5 samples)	320	1/160
2	5.5 (12 samples)	640	1/116
3	6.1 (8 samples)	160	1/26
4	9.5 (8 samples)	640	1/67
5	18.0 (12 samples)	2560	1/142

It will be noted that the five urine samples from Case 1 giving no reaction at 1/2 have been omitted and in this case the real mean titre is obviously less than 1/2. Although the cases are listed in order of increasing urine titre there is clearly no such corresponding order in serum titre. However, there is less variation in the urine/serum titre ratio of the different cases, which is about six-fold, than there is between the serum titre of the different cases which is sixteen-fold.

The tendency towards slightly higher urinary agglutinin titres in samples collected nearer noon may be due to increased urinary concentration as the day gets hotter or to the effect of work or exercise in causing more leakage of antibody from the bladder wall.

It has previously been reported (Archer *et al* 1952) that H agglutinin apparently deteriorates in certain specimens of urine from carriers, and that acidity is not the cause of its disappearance. In the present series of tests such deterioration was not observed. On the contrary 15 specimens were re-tested seven to eight weeks after being passed and four to five weeks after the first test. In 10 the titre had not fallen. In the remainder it was only reduced by about 50 per cent. This difference in behaviour may be due to the fact that many of the specimens in the previous investigation contained the homologous infecting organism in large numbers, whereas those here considered, owing to chloramphenicol therapy, were mostly sterile and none contained the infecting organism. Specific bacterial absorption of agglutinin or antibody protein degradation by bacterial action could account for its loss in the former studies, and could not be factors in those here described.

Failure to demonstrate O and Vi antibody in urine containing H antibody, despite the presence of all three antibodies in the patient's serum in relatively high titre, requires some explanation. Firstly, it is known that O antibody, as measured by agglutination, is more labile than H antibody. The shortest time between collection of urine and O agglutination tests was fifteen days and it is possible that any O agglutinin present was destroyed during this period. On the other hand, it might be considered another argument against the hypothesis that the source of urinary H agglutinin is blood or whole plasma. It has been shown that typhoid H and O agglutinins are contained in different plasma fractions which can be separated by physico-chemical means (Oncly *et al*, 1949). These are both part of the gamma-globulin fraction, however, and it seems

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unlikely that the part containing O agglutinin should be selectively withheld in any plasma leak into the urine.

Owing to long-standing schistosomal inflammation, and possibly other lesions caused by the superadded pathogenic bacterial infection, the urine in these cases is in contact with cellular elements normally shielded by an intact mucosa. It is conceivable that local antibody production occurs under such conditions.

The diagnostic value of urinary antibody tests in an inoculated community has been discussed in the previously quoted paper. Their practical use for detecting carriers in an uninoculated population cannot be assessed without information on the prevalence of urinary agglutinins in the non-carriers of this population. The results here described, however, are sufficiently promising to warrant further investigation.

Summary and Conclusions

Blood and urine samples from four chronic urinary carriers of *Salm. typhi* and from one of *Salm. dublin* have been examined for the presence of a, b, c, d, and g H-specific, and for typhoid O and Vi agglutinins. These patients had never received anti-typhoid inoculations and all had urinary schistosomiasis.

Relatively high titre H-specific agglutinins, homologous with the infecting organism, were constantly present in the blood in each case, and some had fairly high O and Vi titres. In the blood of only one patient heterologous H-specific antibody was present in low titre and to a single antigen only.

Urinary homologous H-specific agglutinins were found at low titre (1/2) in five out of ten specimens from one patient. But such agglutinins were constantly present in all of 8—12 urine samples from each of the other four cases. The titres ranged from 1/4 to 1/20, but were remarkably constant for any particular case. Higher titres were obtained with more samples collected nearer noon than earlier in the day. Heterologous H-specific and O and Vi agglutinins were not found in any of the urine specimens examined for them.

No significant correlation was found between urinary and blood H-specific antibody level, as measured by agglutinin titre. In at least some instances the urine/blood antibody ratio was sufficiently low to preclude simple mechanical leakage of whole blood as the sole source of the urinary antibody. Failure to demonstrate O and Vi antibody in urine containing H antibody, despite the presence of all three antibodies in the corresponding serum, might negate the hypothesis that the urinary antibody derives from plasma. But the apparent absence of urinary O and Vi agglutinins could also be explained by their lability to storage.

The practical use of urinary antibody tests in the detection of urinary typhoid and paratyphoid carriers in an unvaccinated population requires further investigation.

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concentrated *Salm. typhi* H suspension for use in urine; and Major-General A. J. Beveridge, *O.B.E.*, *M.C.*, Q.H.P., D.M.S. M.E.L.F., and the Medical Director-General of the Navy for permission to publish this work.

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Obituary Note

It was with profound regret that we heard of the tragic death of Surgeon Commander W. Sloan Miller very shortly after the completion of this paper, at the hands of the Cairo mob.

Sloan Miller was a laboratory worker of high achievement and even greater promise, who had already most worthily upheld the reputation of his Service in international circles. He had a boldly original and keenly analytical mind, and his help and advice were ever available to colleagues, not only of his own Service, but also of the other Medical Services of the Crown, to whom he was in addition a kind and generous host when they visited Cairo.

His passing is a sad loss not only to his friends and to the Medical Service of the Royal Navy, but to the Armed Forces and to the Medical profession.—Ed.

EXPLOSIVE OUTBREAK OF β-HÆMOLYTIC STREPTOCOCCAL SORE THROAT

BY

Captain F. J. C. ROE, B.M., B.Ch.

Royal Army Medical Corps

This is an account of an outbreak of β-Hæmolytic streptococcal sore throat, occurring in a group of approximately 130 men, acting as an independent unit in the field. Altogether 61 men were affected and admitted to hospital, that is to say almost half the strength of a battery. It was considered worth while describing the outbreak at some length both because of its unusual mode of onset and because several points arise which serve to emphasize the ever-constant need of vigilance in the matter of hygiene during exercises in the field.

Mode of Onset of the Outbreak

The whole of a Field Regiment went on manœuvres for a period of seven days ending at 1500 hrs., 20/7/51. Throughout this period the individual batteries acted as entirely separate units. The only battery affected by the out-

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break consisted of approximately 130 men, of whom 7 were officers, 10 sergeants, and 6 members of the A.C.C. All the rest were bombardiers, lance-bombardiers, and gunners.

On the morning of 21/7/51, the day following the end of the exercise, 17 members of this battery, all below the rank of sergeant, reported sick with sore throat, headache and malaise (Cases 1–17). Seven of these had vomited, one of them (Case 2) repeatedly. In view of the severity of many of these cases, and the presence of membrane in most of the throats, the R.M.O. arranged for all 17 cases to be admitted to the British Military Hospital. Furthermore, he arranged to inspect the throats of all the remaining members of the battery on the afternoon of 21/7/51. During this inspection he picked out 23 more cases, 21 of whom had symptoms but had not reported sick (Cases 18–40). Once again all these cases were below the rank of sergeant, but one was a member of the A.C.C. (Case 37). Thus it was clear that an explosive outbreak of sore throat had occurred which so far had been confined to members of the battery below the rank of sergeant.

Measures to deal with the Outbreak

All clinical cases were admitted to the British Military Hospital. The remaining members of the battery (including attached A.C.C. personnel) were, as far as possible, segregated from the rest of the regiment. They were confined to the precincts of a separate block, and advised to spend as much of the daytime as possible in the open air, and not to mix with members of other batteries. The problem of feeding was especially difficult as there was only one kitchen and dining room for the whole of the regiment. However, this situation was overcome by arranging that the battery fed after all other batteries in one end of the dining room set aside for them. The windows of the dining room were kept open all day. Dishes and cutlery were washed and sterilized twice after each meal. Throats of all remaining members of the battery were examined each day, and fresh cases sent to hospital immediately.

Liaison was established between the A.D.A.H., the Officer i/c Laboratory at Wuppertal, and the R.M.O. of the unit concerned, particularly with a view to discovering the cause of the outbreak.

Measures taken to discover the Cause of the Outbreak

On arrival at the British Military Hospital patients were questioned closely as to the time of onset of symptoms. The results of this inquiry are expressed in the graph. It was noted that in 33 cases the onset of symptoms was between 0400 hrs. 20/7/51 and 0400 hrs. 21/7/51, and that in a further 3 cases (Cases 6, 17, and 24) sore throat was present between twenty-four and forty-eight hours prior to the main outbreak.

Cases 6, 17, and 24 were very closely questioned as to their handling of food, water or milk during the exercise. No significant facts emerged.

All throats were swabbed on arrival at hospital, and all except two swabs (Cases 30 and 58) grew *β-Hæmolytic streptococcus*.

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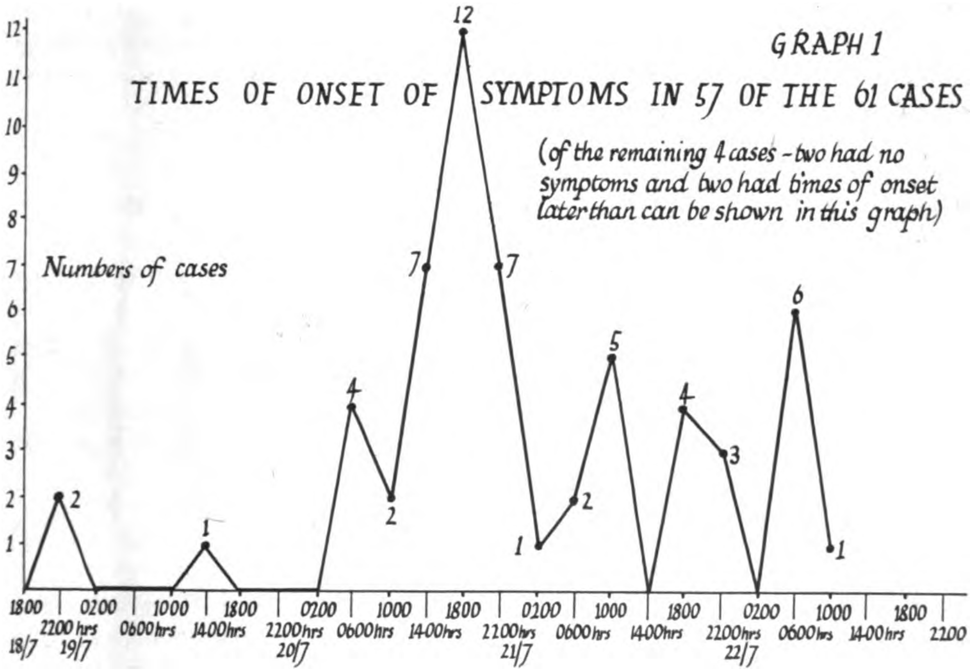
Members of the A.C.C. were interviewed separately. Throat swabs were taken, and hands were examined for septic lesions. A menu for all meals served during the exercise was obtained, and the methods of preparing and serving each individual meal were laboriously ascertained. Finally, a list of all sources of water used by battery was requested.

Several significant facts emerged from these inquiries and examinations and are listed as follows :



Times of onset arranged in 4-hourly groups

From Examination of Members of the A.C.C.

The throat swab from one of the cooks who was not clinically affected (Case 43) grew *β-Hæmolytic streptococcus*. The growth was not profuse and owing to delays (because of lack of media) it was not possible to send a subculture of this organism to Millbank for Lancefield Grouping. However, subsequent throat swabs gave scanty growths of *β-Hæmolytic streptococcus*, although the patient never once complained of sore throat. The R.A.M. College, Millbank, reported two subcultures of streptococci from these later swabs as Lancefield Group A.

Although, at the time of inspection of the cooks (22/7/51), no septic lesions were observed on any of their hands or faces, on 24/7/51 Case 43 (*vide supra*) was admitted to the British Military Hospital with an almost symptomless paronychia

of one finger. Pus from this lesion grew a streptococcus which was subsequently reported by the R.A.M. College, Millbank, as Lancefield Group A.

It later transpired that this same Case 43 had been admitted previously to B.M.H. Wuppertal (28/4/51) with a boil on his face. He remained in hospital ten days on that occasion, but there is no record of a swab having been taken. The patient denied any previous sepsis apart from this.

Result of Inquiry into Food served and Methods of Serving, etc.

As stated above, it had been noted that in 33 cases the time of onset of symptoms was between 0400 hrs. 20/7/51 and 0400 hrs. 21/7/51, and therefore the inquiry was directed particularly at discovering contamination of food, milk or water at a suitable incubation period before the mean time of onset of symptoms of these cases.

It came to light that the meal prepared for the evening of 18/7/51 had been prolonged over a period of almost six hours after its preparation. This was because, just when the meal was about to be consumed, the battery was ordered to move. The meal in question consisted of :

> Thick soup and potatoes ; boiled pudding with a sauce prepared by adding milk powder to cold, unboiled water ; tea and bread.

Case 43 thinks that he helped to mix the milk sauce and may have handled the soup. (N.B.—He is not a good witness.) Unfortunately, none of the food served at this or any other meal was preserved for bacteriological examination.

For tea on the 18/7/51 lettuce and cucumber were served which had been washed in unboiled water.

No other significant facts emerged from this particular inquiry.

Result of Inquiry into Sources of Water Supply

It is understood that this was followed up by the Hygiene Wing, who discovered that the water-cart was filled up without precautions on no less than three occasions with water of unknown purity, and that this was done without the supervision or knowledge of any responsible person.

One of these three sources had been used by another battery without ill effect. A sample from the second of these sources was tested by McGrady method and found to contain 50 *B. coli* per 100 c.c. The third source was not to my knowledge investigated.

The Further Course of the Outbreak

As already stated, 40 cases were admitted to B.M.H. on 21/7/51. On 22/7/51 a further 18 cases were admitted (Cases 48–65) and thereafter only 3 more cases occurred. Two of these 21 further cases were sergeants. No officers were affected. The measures taken were entirely effective in confining the outbreak to one battery.

The over-all attack rate (excluding officers) was approximately 50 per cent. (i.e. 61 cases out of 123 men at risk).

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The Treatment, Complications and Discharge from Hospital

Approximately one-third of the cases were given procaine penicillin (300,000 units I.M. once daily). The remaining two-thirds were treated with sulphonamides in usual doses. Clinically cured cases were discharged when they had achieved one clear swab.

Three cases relapsed two days after discharge (Cases 8, 21, and 39). However, in only one case did the organism persist in the throat after 7/8/51 (Case 57). Complications were limited to peritonsillar abscesses in cases 5, 6, and 16, all of which had the complication on admission. No complications occurred during hospitalization.

Bacteriology

All throat swabs were examined in the routine manner. No Vincent's organisms were seen in any case, and in no case was K.L.B. isolated. Owing to shortage of staff and materials, later swabs were cultured on ⅛ blood plates. This procedure made subsequent readings of plates and subculture difficult.

In 59 out of 61 clinical cases a *β-Hæmolytic streptococcus* was isolated. The exceptions were Cases 30 and 58. It was decided that subcultures would be sent to the R.A.M. College, Millbank, for Lancefield Grouping. Unfortunately, the outbreak had already depleted stocks of media, and there was a two-day delay whilst fresh stocks were obtained for the purpose of subculturing the streptococci. This delay, and the practice of using ⅛ plates for the later cultures, made successful subculture difficult or impossible in some cases.

Of 41 subcultures actually received at Millbank for Lancefield Grouping—

- 25 were reported as *β-Hæmolytic streptococcus*, Lancefield Group A.
- 1 was reported as *β-Hæmolytic streptococcus*, untypable with sera A, C and G (Case 17).
- 6 were reported as sterile on arrival at Millbank.
- 5 yielded staphylococci only.
- 3 gave a growth of *α-Hæmolytic streptococcus* (Cases 6, 28 and 29).
- 1 gave a mixed growth of *α-Hæmolytic streptococcus* and *staphylococcus* (Case 34).

It is very reasonable to suppose that the fact that 15 cases were not reported as giving growths of *β-Hæmolytic streptococcus* was due to the difficulty and faults of subculture.

It is, however, interesting that none of the three cases whose symptoms dated back prior to the main outbreak was reported as having a Lancefield Group A streptococcus (Cases 6, 17 and 24).

Discussion and Conclusions

It must be almost certain that contamination of food, water, or milk was the cause of this explosive outbreak of *β*-Hæmolytic streptococcal sore throat.

Despite the efforts described above to find out, in detail, how the outbreak occurred, it is impossible to come to any definite conclusion.

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However, it has come to light that—

(*a*) The water-cart was filled from possible unsuitable sources on three occasions without proper precautions.

(*b*) There was working in the kitchen a cook carrying *β-Hæmolytic streptococcus* in his throat, who had previously had a boil on his face, and who subsequently developed a paronychia of one finger, which grew a Lancefield Group A streptococcus.

(*c*) Approximately thirty-six hours before the onset of symptoms in the main body of cases, a meal was eaten several hours after it had been prepared, and that the cook, referred to above, almost certainly helped in preparing a powdered milk and water sauce, served with the second course of this meal.

The truth of the matter surely is that lack of good and intelligent hygiene in a unit may only come to light when the unit is plunged into field conditions. In this particular case it seems that if proper precautions had been taken in the sterilization of water and preparation of food, then the outbreak would not have occurred.

One cannot hope to exclude all carriers from kitchens, etc., under present conditions, and therefore one must rely on the sterilization of food by heat very shortly prior to consumption, and the general clean handling of food under all circumstances.

A plea is made for the supervision of food and water during field conditions by adequately trained and responsible persons.

[For lack of space the table of cases has had to be omitted.—Ed.]

ACKNOWLEDGMENTS

The writer is indebted to the Director-General of Army Medical Services for permission to publish this article ; to Colonel A. M. Pugh, Royal Army Medical College, and to Lieut.-Colonel D. W. Bell, Director of Pathology, B.A.O.R., for advice and criticism ; to Lieut.-Colonel J. T. Smyth, Commanding Officer, B.M.H., Wuppertal, for encouragement and facilities ; and to the staff of the laboratory, B.M.H., Wuppertal, for technical assistance.

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At Random

ALL IN THE DAY'S WORK

PART II

GIVING

EXTRACTS OF QUARTERLY WAR REPORTS

BY

Colonel E. I. B. HARVEY, D.S.O.
Late Royal Army Medical Corps

and

Lieut.-Colonel (now Colonel) M. E. M. HERFORD, D.S.O., M.B.E., M.C.
Royal Army Medical Corps (T.A.)

[*Continued from page* 252, *April issue*]

1 *Oct.*

A further message came that only 200 were to go in the next train. The food improved and stores continued to arrive. The Germans were doing their best in view of their own difficulties. Zingerlin stressed their great transport difficulties: (i) The shortage of engines, and (ii) the acute shortage of petrol. He had even stressed the difficulties of finding petrol for the evacuation of our wounded, and said they had borrowed from the S.S. reserves. He had asked whether I would replace it if I got stores from over the river. I said it was possible, and that nearly decided them to allow me to go down to arrange it. However, they ultimately decided that to allow this would be a sign of weakness, and I had unwisely said they would get no petrol to run ambulances now that they only had to run to evacuate our cases to Germany. We suggested that they should evacuate their own wounded and leave us to look after our casualties at Apeldoorn.

2 *Oct.*

An ex-U-boat German-American arrived and tried to persuade some of the men to give family messages for broadcast over the wireless. Every man refused.

Visit from Zingerlin to discuss conditions and ask if we were satisfied. We insisted that any train carrying casualties should be marked by the Red Cross. They agreed to paint crosses on the trucks. In the afternoon 250 light cases were sent to the station with M.Os. and orderlies.

3 *Oct.*

Visited Schloss Haetloo with Zingerlin and Col. Warrack, and talked to wounded.

The train had not yet gone, due to block in line, and 50 more casualties were sent to join the party.

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4 *Oct.*

Hospital Train left. More aerial activity. Everyone in the hospital were hoping for the station to be destroyed.

5 *Oct.*

The Hospital Train for 500 was announced, and loading started at once. Medical personnel were also sent, with Lt.-Col. Alford in charge. Col. Warrack and myself were allowed down to supervise loading.

6 *Oct.*

Heard heavy firing from direction of Wageningen. Frequent aerial activity. We hoped an attack had begun. I visited the Hospital Train, which still awaited an engine, and found a powerful flak train blazing away adjacent. Protested very strongly to the Stationmaster and O. i/c Train and also to Zingerlin, who arrived. Everyone regretted the incident, and they promised to remove the flak train. There was to be no more firing whilst Hospital Train was in the station.

7 *Oct.*

Train still awaiting engine.

General Haubenreiser, D.M.S. Western Area, visited and inspected the Hospital with General Mayer and other Senior Medical Officers.

He asked if we had any complaints and said the treatment must be that of a Hospital, and not a P.O.W. Camp. Zingerlin and General Mayer were very interested in the question of the carrying of arms by Medical personnel and Padres. He said their people had to carry arms or the Dutch, and others, would shoot them if they could.

A particular point raised was when a German doctor and a Padre in uniform, armed, were travelling in an ambulance. They were stopped by an Airborne Padre and allowed to proceed. A little farther down the road other Airborne troops stopped the ambulance and said the German Officers were misusing the Red Cross. They were apparently about to be shot, when the German Priest managed to attract the attention of the Airborne Padre, who intervened and saved them. Zingerlin also asked whether we carried the arms of wounded men in the ambulances. He said that this was done by the Germans. We said that apart from the weapons of the ambulance driver, no arms may be carried in an ambulance. He also wanted to know what we regarded as a defensive weapon, e.g., whether a Tommy Gun was defensive. Zingerlin said that on the previous Hospital Train there was a wagon with 30 unwounded P.O.Ws. He said that on the journey they had attempted to escape. One of them had fired on the guard with a pistol. The guard had replied and four of these prisoners were killed. I could get no further details. The story sounded very unlikely. The men had been thoroughly searched.

8 *Oct.*

Hospital Train had left during the night for the Hanover region.

Heard that a Dutch doctor bringing 800 books to the Hospital had been arrested, and the books confiscated by the Special Police (Himmler). The German doctors were very reluctant to approach these people for the release of the books.

9 *Oct.*

One of the guard had been offensive to Orderlies proceeding on duty, and threatened the A.D.M.S. and myself when we remonstrated.

We immediately went to see the Commandant and protested strongly. He apologised and the guard was removed and the others warned to behave well.

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Six hundred German troops arrived to occupy part of the barracks. In the evening they suddenly hurried off, leaving their food prepared and uneaten on the table. Their first meal since breakfast.

10 *Oct.*

The Germans were beginning to regain confidence and increasing restrictions. The food after considerable improvement was less good.

11 *Oct.*

Up to this time, we had sent an Officer daily to the Dutch Hospital to supervise X-rays and visit wounded. I had gone frequently and freely travelling in an ambulance. The Chief Assistant to Col. Zingerlin, a Major Crammer, now arrived to say that in future, visits would only be with an escort, and that I could only go with Zingerlin or himself. The police had evidently taken exception to our free association with the Dutch. The S.S. were busy routing out underground workers in Apeldoorn.

We asked him to get the 800 books released, and he was very reluctant.

The District Commander, Baron Von H——, who had been much abroad and lived in Shanghai, was very friendly and anti-Nazi. He said in conversation, "If I did anything they would kill my family." We asked him to get the books released and he was also reluctant. He said, "I have to be careful; if I go and ask them, they will say—how do you know we have them ?" and then he might be suspected of undue friendship. The point was interesting because, with other signs, it showed a real fear of all ordinary people who have any contact whatsoever with the Special Police. A spectre in the background.

12/14 *Oct.*

It was increasingly evident that the Germans were reversing their policy of complete "helpfulness" and closing down. No one was allowed to speak to the Dutch without an interpreter present.

The Elizabeth Hospital in Arnhem was evacuated and the British Medical personnel—3 M.Os. and 16 Orderlies—sent to our Hospital.

It was certain that as soon as possible the Hospital would be closed, and personnel sent to Germany. Apparently there was a large P.W. area near Hanover at a place which I think they call Fallingbostel. All Airborne P.Ws. have gone to the Hanover area.

It was, therefore, decided that any remaining personnel (12 M.Os. and 100 Orderlies) who wish to escape shall be urged to go as soon as possible. Col. Warrack and I have rigged up a hide-out in the building with supplies and food.

We had decided to stay as long as there was any possibility of influencing treatment of casualties, and always in the hope of a major British attack. If a train was suddenly announced for all, we were going to retire, and escape when the place was evacuated. I said that as I still occupied a somewhat special position as interpreter and Chief "Protestor," I would leave at the last moment and try and get straight back with the news.

Col. Warrack was very anxious to come too, but was greatly influenced by his responsibilities to the wounded. With this in view, it was ultimately decided that he would hide when I left and then remain to keep contact and advise until the last. Lt.-Col. Marrable felt it his duty to remain with his unit, 181, which was looking after the remaining casualties (90). The personnel of 16 and 133 had gone in previous trains.

14 *Oct.*

The Hospital Q.M. escaped.

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15 *Oct.*

Three M.Os. and 2 Orderlies escaped intending to join a party of Airborne men known to be in a particular locality. A curfew was instituted.

The interpreter came into a room and found officers studying a map and making copies. This was most unfortunate, as he took the only 1 : 100,000 map we had of Apeldoorn region.

16 *Oct.*

Considerable restrictions were imposed. Major Crammer arrived and from his talk it was evident our time was short. A 17.30 hrs. roll call commenced and everyone had to be in the two buildings by dark. The guards were changed for young men and trebled under the command of an officer. This was done in the afternoon. It was raining heavily and gave promise of a foul night. I therefore decided to escape that night and bring back such details as were already compiled.

A list giving number, rank, name and unit, had been made of all men and deaths in our Hospital, and the others in the neighbourhood. This was made in response to a request from an Amsterdam doctor, who said a British officer had landed by parachute and requested such information. It had been impossible to send a list to Amsterdam, so I thought I might as well try my luck.

The R.C. Padre, McGowan, and two others wanted to come, but I considered that two was a maximum. Padre McGowan knew the Osterbeek area and was anxious to try for there, so I decided to take him.

We left at 21.00 hrs. through a side window, and used a blanket to get to the ground. We were aided out by Col. Warrack and Lt.-Col. Marrable. The night was so dark and raining so hard that we lay within five yards of guards patrolling, and the guard officer passed with a flashlight on his rounds even closer. Twice I practically walked into a guard, and was only saved by his movement. Guards were only in the vicinity of the buildings, and once we eluded them, the way was clear along the route chosen.

Our advance was made in single file. I used a prismatic compass which I had been lucky enough to recapture when going in an ambulance to one of the Hospitals. It was very difficult for McGowan to keep distance behind me. It was necessary for him to walk just far enough back for me not to hear his footsteps, to enable me to concentrate on sounds ahead, and yet close enough for him not to lose me, particularly if I suddenly quickened step. We lost touch on many occasions and I had to go back and look for him. As it was, we almost walked into sentries on two occasions.

The dark and continuous rain was at once a great aid and a hindrance. Early on the first night I stepped straight over an embankment and fell into a dyke. Five minutes before, I had tied the compass around my neck, otherwise we should have lost an absolutely indispensable instrument at the outset. We had, however, each got an escape compass, and on one occasion, McGowan, using his compass, saved me walking in a wrong direction.

The first night we walked from 21.00 hrs. to 07.00 hrs. with short halts every hour or so, following almost entirely forest tracks and across sandy waste and heather. Our pre-occupation was to follow a general S.W. course.

In the early light we were lucky enough to pass a small cottage, empty, and with a haystack adjacent. Here we spent the day. For an hour or so we had a small fire and managed to dry some of our clothes. We could not find our position on the map, except on a general N. to S. line.

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17 *Oct.*

At 18.00 hrs. we started out due south, and after about 5 kil. over sandy waste and wood, hit a main road on the outskirts of a town. We had no idea where we were and I decided to inquire at a house. We were sufficiently S.W. for it to be imperative to fix the position exactly for planning a route to the river.

We had no maps for the first half of the route, but I had a 1/50,000 map of the area for the 2nd and 3rd days.

The first farm had a dog chained, but no people there. The second I luckily looked through a window crack and saw Germans apparently on detachment.

The next cottage a woman looked out from her bedroom and told me we were at Otterloo. She said there were very few Germans there. This was very fortunate, because I had heard of Otterloo as a veiy friendly centre.

We had decided to ask for no assistance from the Dutch except in great emergency, because the Germans were being very ruthless, and whereas we might be captured the Dutch who helped us would be shot. However, I thought it was safe to ask for a loaf of bread and information. Here I contacted a man in the road, and he was very helpful.

First he took us to a shed where we found others, and some tea and bread. Then he took us out and walked ahead circumnavigating a German detachment with horses, and put us on a track due south.

By luck rather than judgment we had come on a general line which eminently suited my plans for crossing the Renkum area. It was again raining heavily, and very dark, though flares were frequent. We walked as before until 03.30 hrs. when we were both very tired and wet. We were then in the neighbourhood of the Amsterdam road, and I heard some dogs barking farther along the track we were following, and voices.

We therefore laid down and slept for two hours. On waking, it was obvious we were in no condition to spend the day in thick woods. We therefore decided to proceed with all possible speed and hope for a good site to lay up.

Germans were now more numerous and we passed several detachments in the neighbourhood of tracks near roads. By 07.30 hrs. we had been seen by several Germans in the distance. We were then passing one of the areas near Wolfhezen where many gliders had dropped. Here we picked up two Mae Wests, both with slow leaks, but helpful. It was fortunate for us that the Germans had captured many gas-capes because our gas-capes attracted little attention, and the rain discouraged investigation. We walked over the railway about 250 yards from a patrol who just watched us, and past two further posts near groups of gliders. By this time we had pin-pointed our position and were in an excellent position for the final stage. We found an area of short oak shrubs. These gave us cover, yet allowed us the full benefit of wind and sun. Here we lay and slept and, in spite of heavy showers, managed in the course of the day to dry out some of our clothes. We were about 3 kms. from the river.

During the day we heard noises of building and voices from the farther end of the wood and located a battery of guns due west. There was intermittent shelling from over the river. We decided not to move until it was quite dark. To our disappointment it cleared up. Rain would have helped.

Early in the night we narrowly missed a detachment, and decided to keep to the middle of ploughed fields. Dry beanstalks made a lot of noise, but luckily there was some shelling from over the river into our vicinity. This distracted attention and woke up many plovers. We had already disturbed a number, and they revealed movement.

We passed more gliders. Flares were fairly numerous from the direction of the river.

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For the final stage, I had decided to avoid all woods where Germans were likely to be, and noise was inevitable, and to keep low over open land.

The area of the Heelsumsche from Heelsum to the river east of Renkum seemed ideal. We followed this route. Unfortunately two nights, heavy rain had turned the area into a real morass.

There were sounds of movement and voices in the woods on either side. Some of our shelling had set a house on fire, and as we passed the light across a field, a German post opened with a Spandau, but fired high. This was the only time we were fired at. It was very encouraging to hear the immediate response from over the river to any German fire. A few rounds of a machine gun, or a mortar, brought a heavy salvo of mortar or H.E. The sound covered our movement and distracted attention.

One M.G. evidently fired down a fixed line covering a marsh crossing. There were holes in the gate and a dead cow and another badly wounded threshing about. The noise covered our crossing. Near the river we were held up by a patrol, on a marsh crossing, and flares and soft marsh made it necessary to move on all fours. We were about 500 yards from the river. Here we took off most of our clothes and boots, and tied them up in our gas-capes in order to be immediately ready for crossing. We had envisaged the possibility of crossing separately. I was convinced we should find British troops all along the south bank. McGowan was not so confident, and was in favour of continuing south under cover until near Elst, or even farther south.

Near the river I went quickly ahead to reconnoitre and told McGowan to follow. Going back I had difficulty in finding him. Again I went forward and said to keep close as speed was vital since it was getting near light. I got to the river and found McGowan not with me. I had last seen him 100 yards from the bank. I went back. I had gone half left and he had probably gone straight on. Crawling back over the embankment, I saw two Germans on the skyline moving away north. They also left the area before light. It was then a case either of staying on the north bank until the next night or crossing at once before light. I therefore decided to cross, expecting McGowan to come independently, from farther west along the bank. I therefore swam across to a factory on the farther bank. Here I lost myself in some large buildings, and on coming out saw several figures against the skyline 30 yards away.

Rather to my astonishment (on reflection) I challenged them, and was challenged in return, and told to stay put. The patrol proved to be American, who marched me off to establish bona fide. They were most helpful. I told them about McGowan, and they promised to keep a good look-out and send a patrol across at dusk.

After a rest, I was taken to 101 Div. H.Q. and then on to 30 Corps, there I reported and delivered the papers.

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Matters of Interest

D.G.

THE post-war years during the past century and more have invariably proved to be a period of change, unrest, restriction and difficulty for the Armed Forces of the Crown and their Medical Services ; a period when personal difficulties are enhanced for Officers and men of those Services, when recruitment falls to a minimum and when reorganization and recuperation have to be carried through under adverse criticism and restricted finances.

It was during such a period, which has proved to be no less difficult than its historical predecessors, that Lieut.-General Sir Neil Cantlie, as he soon became, took over the reins of our Service. Right well indeed has he guided and driven the Medical team placed in his charge.

History will record his achievements and the grateful thanks of all members of that team, and their best wishes will surely go with him on his retirement.

In his successor we have a most versatile leader fully capable of upholding the highest tradition of our D.Gs.

T. O. T.

VALE

AT a Regimental Guest Night held at the Headquarter Mess on 27th March, 1952, Lieut.-General Sir Neil Cantlie, *K.B.E.*, *C.B.*, *M.C.*, M.B., F.R.C.S., K.H.S., was dined out on relinquishing the appointment of D.G., A.M.C. Applications to attend the dinner had far exceeded the capacity of the Mess, and a gathering of 75, including 15 general officers, headed by Lieut.-General Sir William McArthur, three Colonels-Commandant (Major-Generals Dowse, Tomory and Macfie) and the D.G. elect (Major-General F. Harris, *C.B.*, *C.B.E.*, *M.C.*, Q.H.S.) sat down to bid farewell to their Director-General.

General Harris proposed the health of the retiring D.G. in a speech which ably combined panegyric with notable entertainment, and Sir Neil replied as fittingly if, understandably, more seriously : "So much to do, so little time." The short speech which followed by General Dowse, as Representative Colonel Commandant, was an innovation which may well be allowed to become a tradition. Finally, Lieut.-Colonel C. E. Bull, retiring simultaneously with the fourth D.G. to whom he had been P.A., replied to the tribute which General Cantlie had paid him. Speeches and other entertainment done, the retiring D.G. left

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the Mess in time-honoured fashion not once but twice, owing to a miscalculation by his chauffeur.

Thanks to the initiative of General Harris, General Cantlie's portrait had been painted and was hung in the ante-room for the first time on this evening. It is an excellent likeness of Sir Neil, in No. 1 dress. Though smaller than the portraits of his predecessors, it denotes a continuation, well suited to modern pockets and to the diminishing space available in the Mess, of a custom which must not again be allowed to lapse.

J. B. N.

NOTES FROM A.M.D.

BY OUR SPECIAL CORRESPONDENT

The Army List is affected by the following promotions:

To be Colonel: Lieut.-Colonel W. A. Y. Knight, 16th February, 1952; to be Lieut.-Colonels: Majors T. N. Fowler, 4th February, 1952; C. McNeil, 16th February, 1952; N. Bickford, 25th February, 1952; J. B. Bunting, 27th February, 1952; O. W. W. Clarke, 9th March, 1952; R. L. Townsend, 13th March, 1952. To be Majors: Captains G. M. Homan, 29th January, 1952; D. E. Marmion, W. J. Irwin, 12th March, 1952.

Following the lifting of the ban on retirement, six Lieut.-Colonels and seven Majors have retired. These are Lieut.-Colonels J. A. MacDougall, J. H. Bayley, C. S. Gross, E. W. O. Skinner, E. G. Dalziel and H. K. G. Nash; and Majors J. W. Spence, V. J. Keating, A. J. Fulthorpe, J. P. Scrivener (resigned), F. Lanceley, R. Paul, N. H. Stewart.

Extracts from the "London Gazette"

18.3.52 *R.A.M.C.*
Major F. Lanceley, M.B. (157735), retires with a gratuity, 17th Mar., 1952.
Major J. P. Scrivener, *M.B.E.* (246208), resigns his commn., 17th Mar., 1952.

26.2.52 Lt.-Col. W. A. Y. Knight, M.B. (45043), from R.A.M.C. to be Col., 16th Feb., 1952.

R.A.M.C.
Lt.-Col. C. S. Gross, M.B., F.R.C.S. (Edin.) (47492), retires on ret. pay, 25th Feb., 1952, and is granted the hon. rank of Col.
Major C. McNeil, M.B. (72154), to be Lt.-Col., 16th Feb., 1952.
Major J. W. Spence, M.B. (102685), retires with a gratuity, 23rd Feb., 1952, and is granted the hon. rank of Lt.-Col.

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29.2.52 *R.A.M.C.*
Lt.-Col. E. G. Dalziel, *M.C.*, M.B. (24431), retires on ret. pay, 27th Feb., 1952.
Major J. B. Bunting, *O.B.E.* (72157), to be Lt.-Col., 27th Feb., 1952.
Major N. Bickford (72166), to be Lt.-Col., 25th Feb., 1952.
Major V. J. Keating, M.B. (85434), retires with a gratuity, and is granted the hon. rank of Lt.-Col., 29th Feb., 1952.
Major (Qr.-Mr.) G. M. B. Smith (99221), retires on ret. pay on account of disability, 29th Feb., 1952.
Major A. J. Fulthorpe, M.B. (154546), retires with a gratuity, 29th Feb., 1952.

4.3.52 Lt.-Col. J. H. Bayley, *C.B.E.*., *M.C.* (8621), retires on ret. pay, 1st Mar., 1952, and is granted the hon. rank of Brig.

11.3.52 *R.A.M.C.*
Lt.-Col. H. K. G. Nash (53482), retires on ret. pay, 9th Mar., 1952.
Major O. W. W. Clarke (72167), to be Lt.-Col., 9th Mar., 1952.

14.3.52 *R.A.M.C.*
Lt.-Col. E. W. O. Skinner, F.R.C.S. (Edin.) (70124), retires with a gratuity, 13th Mar., 1952.
Major R. L. Townsend, M.B. (72163), to be Lt.-Col., 13th Mar., 1952.

Correspondence

Army Medical Service Graduate School,
Army Medical Center,
Washington 12, D.C.
24th January, 1952.

Briagadier C. W. Greenway,
Director of Medical Services,
General Headquarters, FARELF,
Singapore, Straits Settlement.

Dear Brigadier Greenway,

The Fourth United States Army Medical Research Unit has recently returned to the Army Medical Service Graduate School following a five months' period of work at the Institute for Medical Research, Kuala Lumpur, Federation of Malaya. As in the past, much of the work was done in close collaboration with Royal Army Medical Corps personnel and the success of the mission depended to a considerable extent upon the valuable help given by this group.

In particular, it is desired to express appreciation for the permission which was granted to our unit to work at the British Military Hospital, Kinrara. The following Royal Army Medical Corps personnel are due èspecial thanks :

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Colonel W. D. Hughes, Chief Medical Consultant, and Lieut.-Colonel F. E. Buckland, O.C., Path. Lab., of G.H.Q., FARELF, Singapore ; Colonel W. A. D. Drummond and Lieut.-Colonel J. E. C. Robinson, of A.D.M.S. Office, H.Q., Malaya, Kuala Lumpur ; Lieut.-Colonel K. Clarke, O.C., Major D. D. G. Hetherinton, Medical Specialist, and Major P. H. A. Sneath, Medical Officer, of the British Military Hospital, Kinrara ; and Capt. J. M. Pirrie, Medical Officer, Malayan Scouts Unit, Dusan Tua.

It is anticipated that Major Hetherinton and Major Sneath will be co-authors on a report to be published from the Army Medical Service Graduate School tentatively entitled "Japanese B Encephalitis in Malaya," and that Captain Pirrie will be co-author on a report provisionally entitled, "Outbreaks of Leptospirosis during Jungle Operations in Malaya."

Most sincerely yours,

WILLIAM S. STONE,
Colonel, M.C.,
Commandant.

cc. G. M. DENNING,
Lieut.-Colonel, R.A.M.C.,
British Medical Liaison Officer.

The Editor,
The Journal of the Royal Army Medical Corps.

SIR,

May I seek the hospitality of your columns to comment on an article published by Capt. A. J. Davies in the February issue of the Journal ?

I do not wish to belittle Capt. Davies' efforts. He has obviously taken trouble with this article, but unfortunately certain inherent errors make it most misleading. He must forgive me if I draw attention to these. The subject is important.

Firstly, his title is quite incorrect. The majority of foot interdigital fungus infections are due to *Trichophyton interdigitale* ; some are due to *Epidermophyton floccosum*. Presumably he is not refering solely to these latter, so that "Dermatophytosis" as a heading would have been better than "Epidermophytosis."

The figures quoted are particularly misleading. Cases are classified into clinical groups, but the correlation between fungus incidence and the groups is not at all clear. For example, the majority of cases fall into Group 1, which I assume to represent those showing minimal or slight activity. Of this group Capt. Davies says that it was possible in a selection of cases to demonstrate fungus microscopically. It would be interesting to know how this selection was done, and equally one infers that in a selection of cases it was not possible to demonstrate fungus, or at least that no attempt was made to do so. He admits that even in the group severely affected it was not possible to demonstrate fungus in *some* cases. I should like to ask in how many cases, and also why he should suppose that such cases were in fact fungus infections. He goes on to say that in

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this "severe" group the patients complained of itching, smarting, and sometimes of the smell. It seems to me that these symptoms, particularly the smell, may well be symptoms of hyperidrosis, and not tinea as is suggested.

It is clear that there has been an increase in incidence in these soldiers of foot *abnormality* up to the six-month period, and that subsequently there is no further increase. Capt. Davies attributes this to a spread of fungus infection. He may be right, but his figures do not convince. I would expect to see an increase of foot abnormality due to a variety of causes in soldiers during the first six months of their training. Fungus infection is by no means the only cause of foot abnormality, nor of interdigital maceration. This is in fact indicated in the article. Capt. Davies says, "It is known that epidermophytosis is associated to a marked degree with hyperidrosis," and he then goes on to show that among his groups there are a large number of patients whose feet sweat excessively. Is he in fact dealing with a hyperidrosis or a fungus infection ? It is a matter of some importance.

The value of the discussion on treatment is negatived by the fact that neither he nor we know what is being treated. Also we are told that it was only possible to obtain 47 cases out of the large series for treatment. It is not clear why this was so. Disregarding these facts, I would like to say that I am not at all in agreement with the views presented on the treatment of foot fungus infections. I would qualify this by saying that the opening paragraph on treatment is, absolutely true, and cannot be over-emphasized. To quote : "The chief danger in the treatment of fungus infection of the feet, as with all skin diseases, is over-treatment."

I have discussed the treatment of tinea of the feet and other areas in some detail in recent articles in the Journal, so that I will not elaborate in this matter. Suffice to say that keratolytics should be used with extreme caution because of the dangers of foot eczematization, which are admittedly less in temperate climates than in the tropics. Mercurials, particularly phenyl mercuric salts, may, and do, cause sensitizations.

Work is at present being done on prophylaxis ; it is possible that an undecylenate dusting powder may prove the best prophylactic yet available. The question of prophylaxis is of tremendous importance because if we could eradicate the *Trichophyton* from between the toes we might reduce very considerably the incidence of *T. mentagraphytes* body infections in the tropics.

Finally, I would agree most whole-heartedly with Capt. Davies' concluding observation that it it is only by taking the strictest measures, and by adequate education of troops, that the incidence of this disease will be reduced.

I am, Sir, yours, etc.,

KEMBLE GREENWOOD, M.B., M.R.C.P.,
Lieut.-Colonel, R.A.M.C.,

Adviser in Dermatology.
War Office, London.

25/3/52

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Book Reviews

EMERGENCY SURGERY. By Hamilton Bailey, assisted by N. M. Matheson. Part IV of Sixth Edition. 1952. Publishers : John Wright & Sons Ltd.

The sixth edition of this popular Emergency Surgery is being published in five separate parts—Parts I and II in 1948, Part III in 1950, and Part IV 1952.

This volume maintains the standard of the first three parts, and of the previous five editions. The only disadvantage is the wait for the fifth and last part.

Part IV deals with the Emergency Surgery of the thorax, spine, head and neck, blood-vessels, bones, joints, tendons and nerves. It is as usual very well illustrated and the explanatory text is concise and clear—and the production excellent. Bailey's Emergency Surgery remain a most useful book for all young surgeons and especially for any who may have to work on their own.

A. G. H.

OUR MEN IN KOREA. By Eric Linklater. London : H.M. Stationery Office. 1952. Paper covers, pp. 79. 2s. 6d.

This is the first official account of the Commonwealth part in the Korean campaign, from the end of August, 1951, when the Middlesex and the Argylls arrived in the shrinking bridgehead at Pusan, to the formation of the Commonwealth Division on 28th July, 1951.

The history of the events leading up to the formation of the first Commonwealth Division must necessarily be inspiring and this is a worthy record. The story is told in a straightforward way which sometimes conveys an effect of breathlessness as though the author was hurrying to cover the ground. At other times, the flow of the narrative tends to be dissipated in detail more appropriate to a history on a larger scale ; it is fair to say, however, that this is the result of attempts to do justice to everybody.

The illustrations are excellent but sometimes, when a particular action is being followed, it is annoying to find that places mentioned in the text are not shown on the maps.

A chapter on "The Ingenious Enemy" shows clearly the formidable nature of the troops which the United Nations Forces are fighting—". . . Chinese tactics and discipline were truly remarkable."

The high standard and the international character of the Medical Services are given due recognition. Officers with memories of Indian Service will be glad to see the tribute to 60 Indian Field Ambulance, which has distinguished itself in Korea. The incidence of sickness was certainly less than was expected, but the statement that the number of sick hardly exceeded those wounded is perhaps too optimistic.

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One sentence deserves to be remembered by everyone who is concerned with the prevention of cold injuries. It refers to the troops of 27th Brigade and gives in a few words the reason for their wonderful record—". . . no clothing, not Eskimo furs or Manchurian quilting, would have kept the soldiers weatherproof if their spirit had failed."

The reviewer was glad to see mention of the Australian No. 30 Communications Squadron, whose courier planes were the passenger vehicles of Korea for so many and whose Dakotas flew the Commonwealth casualties to Japan, in addition to their other tasks of transporting men and material.

The Author's Note at the beginning of his narrative deserves to be quoted in full:

> "It must be emphasized that all this narrative does is to offer some account of the part played in the Korean campaign by troops of the British Commonwealth between the outbreak of war and July 31st, 1951. No attempt has been made to tell the whole story of the campaign, and the reader must always remember that the British forces were only a minority in a large international army to which the United States of America contributed by far the greatest strength. The story of the Commonwealth Brigades was worth the telling by itself, but it has very little meaning except in the consciousness of that larger effert of which it was a fragment."

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Journal
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Original Communications

EXERCISE "MEDICAL MUSHROOM"

D.G.A.M.S. ANNUAL EXERCISE, 1951

BY

Brigadier F. M. RICHARDSON, D.S.O., O.B.E., M.D.

SOME fifty years ago, whilst Lord Roberts was warning the country of the dangers of military unpreparedness, a less well known soldier was elaborating the same theme. Colonel G. F. R. Henderson, a prolific writer on the Science of War, best known for his life of Stonewall Jackson, pointed the need for study of their profession by soldiers of all ranks. Moltke, the real founder of the great German Army which was to bring us so near to disaster, knew, said Henderson, "not only how to command an army, but how to teach an army." The Prussians, recognizing that intelligent co-operation was of more value than mechanical obedience, were the first to make the distinction between "orders" and "instructions." The British tendency was towards regarding tactics and strategy as matters for common sense, and Henderson, holding that they were matters for profound study by professional soldiers, pointed out that "the soundest common sense must be most carefully trained." "All war," he agreed, "is simple, but the simple is most difficult."

A recent comment by General Gruenther, too good to be kept from any who may not have heard it, was: "There are two professions in which the amateur is far better than the professional. The second of these is military strategy."

Colonel Henderson would find much to commend nowadays. At large scale manœuvres commanders and troops are practised in their duties in the field ; the only factor which cannot be properly studied being unfortunately the most important of all—the moral, which, as we are never tired of reminding one another, Napoleon said was to the physical as three is to one. We can see how our soldiers react when tired and cold, but not when tired, cold, and scared.

The education of senior officers in the military profession is provided for by

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the so-called study periods or indoor exercises. Since the former term is too suggestive of the sixth form and arouses uneasy feelings as to the possible penalties of inattention, the latter is preferred, though itself not entirely self-explanatory, since exercise is usually strikingly lacking. For the benefit of those who have not attended them, these exercises somewhat resemble the sessions of a military soviet at which all can speak their mind free from fear that deviationist tendencies will be punished. Not infrequently some time is spent in proving Colonel Henderson's thesis that "the simple is most difficult."

For his exercises in December, 1951, the Director-General chose two important main subjects. The first was the medical aspects of atomic, biological, and chemical warfare; and the second an examination of how the present field medical organization, adopted as a result of the experience of the last war, measures up to present-day conditions.

The first day began with a presentation by Brigadier D. Bluett of the case for and against the use of trailers in field ambulances, including a demonstration of some of the points, and an open discussion. This was a useful period, because we will certainly have to use more trailers than we have been accustomed to, since there will, in the early stages of any future war, be a considerable dearth of prime movers—a term which does not, as one might think, merely describe the vehicle which tows all the other vehicles in the morning to get them started.

Next, after we had heard a report from Colonel G. Anderton, A.D.M.S., 1st Commonwealth Division, upon the good work being done in Korea by R.A.M.C. corporals with battalions, Lieutenant-Colonel Ahern demonstrated the proposed new equipment for regimental medical establishments.

One of the aims of this is to enable the R.M.O. of fighting units to take forward the essentials for his R.A.P. in battle—his "F" Echelon equipment—in circumstances in which his 3-ton lorry cannot accompany him. This "F" Echelon equipment is portable by pack or in a jeep and trailer—the 10-cwt. trailer being a recommended addition to present transport scales. Drugs, etc., have been brought up to date, and a box of empty bottles and ointment jars suggested, so that mixtures can be carried to suit individual preferences and seasonal needs—"cough mixture in winter, and calamine lotion in summer."

After lunch we saw a helicopter and an Auster adapted to carry two stretchers, with a hinged tail. (Later in the exercise we saw the Westland Sikorski, which carries six stretchers, and a Bristol Sycamore adapted to carry two.)

Major-General Bower, Director of Land/Air Warfare, introduced a talk by Major Coyle on the Army Light Aircraft Organization, and took part in the subsequent discussion during which we heard a talk by Wing Commander Dearberg from the Air Ministry. In discussing some lessons of the recent manœuvres there was general agreement on the inadequacy of the present provision of wireless sets for the medical services of divisions—i.e., a pool of four sets which we share with Provost, and even possibly with other claimants on their use indicated by a nebulous "etc." in the establishment of divisional signals regiments. Fears were expressed that without adequate wireless control the medical services of a modern division could not be fully efficient, a danger

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which particularly affected armoured divisions. The Director-General assured the meeting of his agreement with this view, and of his intention to press for the restoration of the divisional medical wireless net. He emphasized how the lack of R.T. control had contributed during manœuvres to faulty deployment of field ambulances—too many field ambulance vehicles and personnel being too far forward in brigade areas, leaving divisional troops and administrative areas without medical cover.

Dealing with the growing tendency towards suppression of the red cross the Director-General stressed that when a C.C.S. complies with the requirements of paragraph 176, R.A.M.C. Training Pamphlet No. 2, it should not ever be necessary for tactical reasons to forbid its display of the red cross. For the A.D.S. his ruling was that "whilst it is agreed that use of the red cross must be secondary to tactical considerations, this should not lead to the ruthless suppression of the red cross on every occasion. For example, once the element of surprise is lost and the enemy clearly knows that a formation is in a certain area, the red cross might be displayed by an A.D.S. if it were a reasonable distance from a headquarters or gun area. The policy of the A.D.M.S. must be to ask the divisional commander for permission to display the red cross as often as the tactical situation will allow."

The second day was devoted to atomic warfare and began with a most interesting lecture by Colonel Tyler, commandant of the Joint School of Chemical Warfare, on the tactical uses of the atomic bomb. Lieutenant-Colonel Ahern then staged a fashion parade (see Fig. 1) illustrating the particular risks of existing orders of dress in the Army, from (*a*) "flame burns" and (*b*) "flash burns." In this convenient classification of burns resulting from an atomic explosion, (*a*) flame burns are burns of various degrees from contact with fires or personal clothing set alight or scorched; and (*b*) flash burns are burns due to the intense thermal radiation of the atomic flash, which in the slighter degrees at the longer distances may show only early erythema before later development of vesication. Soldiers suffering from slight or early flash burns of face and hands will have to remain on duty and be prepared to fight if the anticipated enemy attack, to which the atomic explosion was a prelude, should develop. To enable them to do so some form of protective glove must be provided, and Major-General Mollan described experiments which have been carried out in the R.A.M. College in this matter. Major Kippax demonstrated radiac instruments used in the detection and estimation of radio-activity.

Clothing and the Atom Bomb

To be of value clothing should fulfil the following requirements:

(*a*) It should not be inflammable.

(*b*) It should provide good insulation against the scorching heat from the bomb.

(*c*) It must cover as much of the body surface as possible and thereby prevent flash burns.

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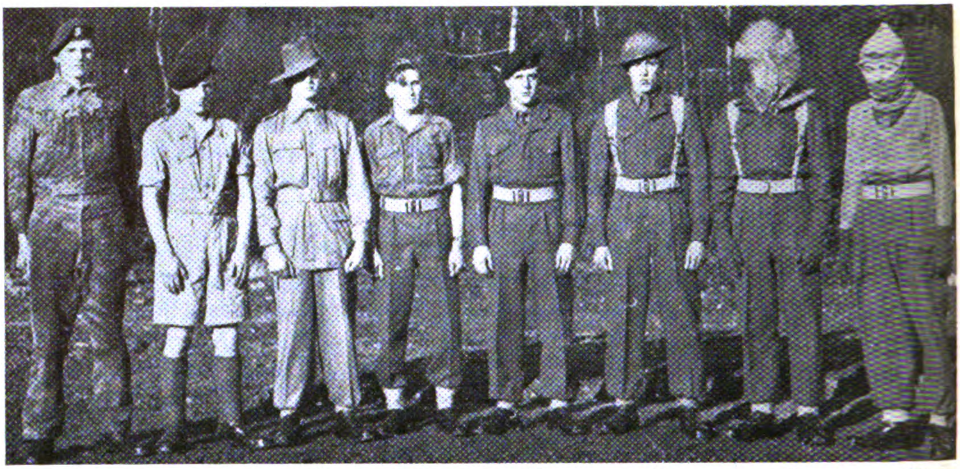

A B C D E F G H

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FIG. 1.—VARIOUS TYPES OF ARMY CLOTHING

"A" *Oily Denims.* Provides good protection against flash burns, but poor insulation and is very inflammable.

"B" *K.D. shorts and shirt with sleeves rolled up.* Eighteen per cent. body surface exposed. Negligible insulation. Material would ignite at 1¼ miles from GZ of a standard atom bomb.

"C" *K.D. slacks, sleeves rolled down and slouch hat.* The danger from poor insulation and of catching fire remains, but only eight per cent. body surface is now exposed.

"D" *Battle dress, shirt sleeve order.* Fourteen per cent. body surface exposed. Insulation is fair except where the shirt is in close contact with the shoulders. This clothing is woollen, will not burn, but will char at about 1¼ miles from GZ.

"E" *Battle dress.* Seven per cent. body surface exposed. Good insulation. Will char at 1¼ miles from GZ, but will not burn.

"F" *Field Service Marching Order.* The steel helmet affords considerable additional protection from flash burns and scorching.

"G" *Field Service Marching Order with improvised netting helmet screen and gloves.* These afford a further appreciable reduction in the dangers of scorching and flash.

"H" *Fatigue dress.* This soldier is wearing his jersey, gloves and a balaclava made from a cap comforter. This dress will not burn, provides good insulation and covers practically the whole body.

A most interesting series of demonstrations and playlets was then staged by the Field Training School. We saw the effects of an atomic explosion on various types of infantry post in the field, and the protection which well-made dug-outs and slit trenches can afford. Eighteen inches of head cover reduces gamma radiation by four-fifths and protects against thermal radiation at all distances. Ordinary slit trenches afford protection varying with distance and direction from the explosion, and even the man caught in the open will get some protection if he can get into his slit trench within one second. Whilst the heat radiation is directional, the gamma radiation is not, as gamma rays become scattered, and at ranges where shelter might make all the difference to the casualty risk they descend upon the body from all directions. Thus a slit trench which, if deep enough, gives complete protection from heat radiation gives only partial protection from gamma radiation. The special danger of uprooted trees must be remembered by troops who tend when possible to be somewhat "forest bound."

An excellent type of dug-in R.A.P. (see Fig. 2) was shown.

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In the playlets and the demonstration of a field ambulance dealing with atomic bomb casualties, with other-rank teams dressing burns, "documenting" cases, and reading and recording the degree of radiation to which they had been exposed, the extent to which we will have to rely on well-trained other ranks was underlined by the young soldiers of the Field Training School, who played the leading parts with distinction. The realism of the demonstrations was enhanced by the brilliant "casualty faking" of Staff-Sergeant Reynolds and his helpers; and one of the more moribund of their specimens had reached the medical ward of a general hospital in time to illustrate the talk on the Radiation syndrome read

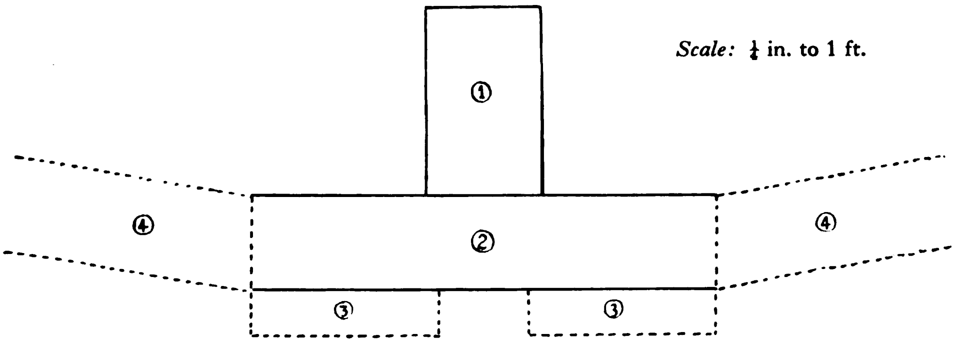

FIG. 2.—SUGGESTED DESIGN FOR DUG-IN R.A.P.

Stage 1. Dig pit (1) 8 ft. × 5 ft. by 3 ft. deep. This provides cover in which M.O. can work at once.
Stage 2. Dig pit (2) at right angles to above 20 ft. × 4 ft. by 3 ft. deep. This provides cover for three stretcher cases.
Stage 3. Dig two bays (3) at the opposite side to (1), each 8 ft. × 2 ft. by 3 ft. deep.
Stage 4. (*a*) Deepen (1) and (2) to 6 ft. deep.
(*b*) Construct sloping in roads (4) to join each end of (2) at 6 ft. depth.
Stage 5. Roof pits (1), (2) and (3).

Time required to dig, approximately 200 man hours.

by Colonel Meneces for the Director of Medicine. To the long discussion which followed valuable contributions were made by Dr. J. Loutit, Director of the M.R.C. radiobiological research unit at Harwell, and by Mr. P. Clarkson of Guy's Hospital, who amongst many interesting points suggested that our ideas about local penicillin and intravenous fluids in the treatment of burns must be kept under careful review. On the whole, although the pressing and complex problems of atomic warfare were painfully obvious, they seemed to come into focus. As in all past warfare, apart from the inevitable influence of bad luck, badly trained, ill-disciplined, and careless troops will suffer most. Trained soldiers can do much to protect themselves, and a field ambulance if itself intact can attack the problem with determination.

On the third day, from the Chemical Warfare playlets staged by Major Whitcher with the help of Lieutenant-Colonel Wybergh and Surgeon Commander McKee from Porton, we learned that here again it is an affair of seconds, for if the soldier is not observing the "safety rule" when a concentration of nerve gas is put down his respirator must be on in one second if he is to avoid most unpleasant effects from these poisons, which are cumulative in their effects, and

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to which increased susceptibility persists for some time after exposure. During the last war one often suspected that the chemical warfare experts might not be displeased if given a chance to prove their theories in the field. Many of their appointments would have been automatically up-graded at the onset of chemical warfare, and I recall one who ended a moving poem describing the horrors of such a disaster with the lines—

> "Hitler suffers shame eternal
> I—become lieutenant-colonel."

They could fairly claim that just as tear gas disperses a mob less brutally than bullets, so chemical weapons were more humane than explosives, causing less death, less blinding, and virtually no mutilation. With the motto, "A casualty is a liability, a corpse is but a memory," their aim was to cause maximum embarrassment and lowering of morale and the minimum of fatalities. Nerve gas has altered all that, and in Major Whitcher's smoothly persuasive Grand Guignol there was no advocacy of the offensive use of gas, and no underestimation of its evil effects. It was encouraging to learn what strict observance of the "safety rule" (which is reproduced at the foot of this page) and good gas discipline can do in prevention, and that for treatment we have a good antidote in the early injection of atropine, which is repeated as required, nerve gas casualties having a remarkable tolerance for atropine. For milder cases with only eye symptoms, which are unaffected by atropine injections, atropine ointment gives quick relief. The problem of restoring respiration in cases with paralysis of the respiratory muscles by means of positive pressure artificial ventilation was also discussed.

Chemical warfare would give still more responsibilities to our R.A.M.C. other ranks, especially to the N.C.Os. with combatant units, and the Director-General said that he hoped that we would not overburden them. I believe that, although the National Service soldier has rightly earned our esteem, the satisfaction often expressed by inspecting officers is not always shared by the specialists whose cases these young orderlies are nursing. Keen, willing, and intelligent learners though many of them are, they are just not with us long enough to become the equal of that great body of experienced nursing orderlies with whom we began World War II, who were the backbone of the nursing staff of many a field unit and surgical team.

NOTE: THE SAFETY RULE

If for no obvious reason you have

(*a*) Dimming of vision and difficulty in focusing on close objects;
(*b*) Irritation of the eyes;
(*c*) Sudden headache;
(*d*) A feeling of choking or tightness of the chest and throat;
(*e*) A running nose;

or there is a

(*f*) Hostile bombardment;
(*g*) Suspicious smell;
(*h*) Suspicious liquid;
(*j*) Hostile smoke;

then for safety the presence of a war gas must be assumed until proved otherwise.

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The possibilities of biological warfare and means of protection against it in the field were then described by Brigadier Sachs, who with the help of Colonel Macfarlane and a team of experts from Porton showed us how such agents may be detected and identified in the field. Brigadier Sachs ended his lecture with the assurance that biological warfare could probably not be used with success against this country when in a full state of preparedness to preserve the public health. As Lieutenant-Colonel Cruickshank, Major Bruce White and Mr. Powell performed their esoteric mysteries at their altars, which were exact replicas of the benches in the new Mobile Pathology Laboratory, it may all have seemed to them to be simple, but amongst their high-ranking audience a few disciples of Colonel Henderson were finding that "the simple is most difficult." This subject does not lend itself to further elaboration here even if I were able to do this properly. In these "debunking" days, when the Seven Wonders of the World are forgotten heaps of ruins which few could name, it is comforting to retain one's faith in a few well-chosen mysteries. For me these shall be the Loch Ness Monster, the Abominable Snowman and the Director of Pathology.

The day ended with two interesting lectures—"Recent Advances in Dental Surgery," by Colonel Brazenor; and "Medical Aspects of the Campaign in Korea," by Lieutenant-Colonel Niven. It was wonderful to hear that the dental drill may be replaced by a current of charmed air containing abrasive particles, though the sensitive may still get a twinge from the name selected for this procedure—the "air-brasive" technique. The interest shown in Colonel Brazenor's streamlined chromium-plated dentures seemed to promise some flash and sparkle in the oratory at next year's exercise.

The last day of the exercise was less spectacular but no less important, and great interest was aroused by the discussions which ranged over all field medical units, the field dental organization, army health organization, and the part to be played by other ranks of the Q.A.R.A.N.C. in the field. For a précis of the opinions expressed, for the Director-General's views in his summing up of the exercise, and for an elaboration of my brief account, I refer you to the official record of the exercise which will shortly be published. I hope that it will be as valuable a training document as its predecessors, the reports on medical exercises "Bamboo," "Britannia" (Vol. 11) and "Horatius" (Vol. II).

Ending as I began with Colonel Henderson, I recommend to you the study of these four medical exercises as he recommended to officers the careful study of campaigns. Reminding us of Napoleon's dictum that "the only right way of learning the science of war is to read and re-read the campaigns of the great captains," he warns that the study is laborious as there are no convenient summaries. When Napoleon read the campaigns of Alexander, Hannibal, and Cæsar he was not in search of hints on strategy or tactics, but of how the great leaders' minds worked. By no means every word in these exercise reports will stand the test of time, but you will find in them useful indications of lines of thought, and not on tactical or administrative matters alone. The British are of warlike stock and on exercises, as in war, like to feel familiar with the battlefield and with the workings of generals' minds, but when at one of these exercises

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someone, whether in the uniform of the services or of Harley Street, gets up and talks pure doctoring, as did Mr. Clarkson during "Medical Mushroom," our hearts warm to him. In these exercises you will find most interesting professional communications from such authorities as Professors J. Bruce, H. L. Marriott, J. R. Squire, A. B. Wallace, Sir Arthur Porritt, Sir Ernest Rock Carling, Sir Claude Frankau and Dr. Wansborough Jones. These reports deserve to be taken from office cupboards for an occasional airing.

Owing to the Director-General's absence on tour I cannot submit this article for his approval, and this makes it easier for me to say here what was very much in the minds of us all on the last day of his last exercise. This is to thank him for these four exercises, not only because as training material they reinforce the value of the new R.A.M.C. Training Pamphlet No. 2, published during his tenure of office, and record the opinions of many experienced officers in the post-war period, but because they have been such fun. The staging and presentation of the last three have been a series of triumphs for a new unit which the Director-General brought into the world and nursed through its teething troubles—the Field Training School under its first two commandants, Colonels Crosse and Ahern.

Regular officers have met, lived with, and exchanged views with senior territorial medical officers, combatant officers, medical officers of the sister services and from Government departments and establishments, and even with senior medical officers of most of the North Atlantic Treaty Organization countries.

Mindful of their warrior ancestry though they may be during a war, the British have traditionally neglected or even despised their soldiers when a long war was over.

Wellington's infantry, called by an enemy marshal "the finest in the world," who had done more than any other troops to defeat Napoleon, were left—those who were not dying of their wounds in some forgotten corner of Belgium—to trudge home and "given neither pension, nor medal, the finest army England had ever had was dismissed without regret or gratitude." One of Marlborough's soldiers, Corporal Mathew Bishop, had complained of the same neglect in these well-known words :

> "God and a soldier, men alike adore
> When at the brink of danger, not before.
> The danger past, alike are both requited—
> God is forgot, and the brave soldier slighted."

But this time, whether because of National Service, a kindlier Press, or more probably the continuing threat to national security the anti-military revulsion has not occurred. The army is almost popular ; its manœuvres are watched, if not with interest at least with amused tolerance.

The medical services, under the leadership of Lieutenant-General Sir Neil Cantlie, have taken their full share in the recent drive towards efficiency and readiness for war.

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HEALTH EDUCATION IN THE ARMY

A FACTUAL SUMMARY

BY

Major M. M. LEWIS, M.D., D.P.H., D.T.M. & H., D.I.H.

Royal Army Medical Corps

Introduction

MILITARY medicine has shown an increasing bias towards the preventive, as opposed to the curative side. The origins of this bias are rooted deep in military history, the study of which reveals many sharp lessons of manpower loss inflicted upon armies by preventable disease.

In comparatively recent times the diseases which scourged the armies of the past with great epidemics have, one by one, been brought under control; these advances have enabled military hygienists to pay more attention to enhancing the quality of health itself, and to superimpose upon the desire to eradicate disease the quest for positive health.

The development of this more positive attitude towards health has increased the importance of health education. It is possible to achieve a considerable amount of disease prevention by applying measures over which the individual soldier has no control; in fact, these are the only measures which can be assured of complete success. Examples of such measures include the eradication of insect vectors of disease and the provision of safe drinking water; although, admittedly, it is seldom possible to exclude the human element completely, so that personal hygiene remains a vital factor in the prevention of disease.

But for the attainment of positive health, personal hygiene is a *sine qua non*, since no master-stroke of medical administration can confer it upon the community. Positive health can only be attained by those individuals who both desire it and believe in it, hence it is bound up more with a healthy mental attitude to life than anything else. It is a primary object of health education in the Army to inculcate this healthy mental attitude to life.

The Army is, potentially at any rate, a selected fit community and must be maintained as such. To succeed in this the importance of health must be instilled into every man in the military community, irrespective of rank, trade or grade. The individual soldier must be taught to maintain himself in good health in any part of the world—hazards of climate, geography and occupation notwithstanding; he must also be taught how his own actions, such as food handling, may affect the health of his comrades.

Leaders and administrators must be taught the communal aspects—man-management in relation to health, particularly mental health.

An aspect concerning health education in the Army which must not be overlooked relates to conscription. The fact that the majority of the nation's

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young men serve in the Army provides excellent opportunities of raising the standard of health knowledge of the nation as a whole.

Organization for Health Education in the Army

The Role of the War Office

The arrangements for health education in the Army are controlled by the War Office, principally through the Director of Army Health. Some degree of central control is essential to ensure co-ordination of effort and a common policy. In addition, publications, films and propaganda leaflets relating to health are dealt with by the Directorate of Army Health.

The Role of the Royal Army Medical College

This College has a Department of Army Health which is concerned with instructing those who conduct health education and take other action to promote health in the military community. The courses which study Army Health subjects include those for Senior Medical Officers, Specialists in Army Health, National Service Medical Officers and officers of the Queen Alexandra's Royal Army Nursing Corps.

In addition, special lectures on health matters are given as required to special groups, such as officers of the Royal Army Service Corps. Also the Department maintains liaison with other bodies interested in health education, such as the Central Council for Health Education, London School of Hygiene and Tropical Medicine, Royal Institute of Public Health and Hygiene, and the Royal Sanitary Institute.

The Role of the Army School of Health

The Army School of Health has a wide variety of tasks in the sphere of health education. Medical and Dental officers and other ranks are given courses designed to enable them to play a part in the health education of others and to maintain the health of those troops for whom they may have responsibilities. Surgeon-Lieutenants of the Royal Navy attended similar courses, and officers of the Queen Alexandra's Royal Army Nursing Corps attend a certain number of the lectures and demonstrations.

Combatant officers, both senior and junior, regimental and staff, attend courses dealing with the health aspects of man-management. These courses enable them to make an important contribution to the prevention of disease in the Army, to conduct health propaganda and to teach health discipline to the troops for whom they are responsible.

The courses to this group of personnel are probably the most important of all, since health measures cannot be successful unless the officers of combatant units and formations appreciate their value and are enthusiastic; also, much depends upon the junior officers who are in close contact with the men, and who are ultimately responsible for ensuring that health measures are carried out.

Similar instruction is arranged for combatant W.Os. and N.C.Os., also for officer cadets. In addition, it is hoped to introduce special courses in Army Health for corporals on promotion to sergeant, and for captains on promotion to

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major ; questions on the subject are included in the relevant promotion examinations.

Some soldiers, by virtue of the work they have to do, can directly affect the health of their comrades, and so require special attention in schemes of health education. For this reason special instruction is given to personnel of the Army Catering Corps, men who are trained to operate water purification equipment, and men who are employed on unit sanitary duties, anti-malaria work, etc.

In the Army it is the Commanding Officer, and not the Medical Officer, who is primarily responsible for the health of troops. In support of this policy, and for other reasons, a great deal of basic health teaching in the Army is carried out by regimental (as opposed to R.A.M.C.) officers. To achieve this, selected regimental officers are specially trained at the Army School of Health to become "health educators." Their training enables them to give lectures and to lead discussions on both the personal and the communal aspects of elementary health discipline. To assist them in this work various visual aids are provided, including films and film-strips, and at the end of their training period they are given notes for use as ***aides-mémoire*** in preparing lectures.

Special Arrangements for the Health Education of Troops Overseas

The overseas establishments of Army Health officers, Field Hygiene Sections and Hygiene Wings, makes provision for the formation of "ad hoc" schools of health as required. Such arrangements are of special value with regard to the health education of African and Asian troops serving with our forces.

In addition, the School of Hygiene, Far East Land Forces, is specially established and equipped to deal with problems of health education peculiar to that theatre.

Health Education at Training Establishments for Officers and Officer Cadets

At the Staff College, health problems are introduced into exercises and other forms of training, and officers attending the courses there attend demonstrations at the Army School of Health.

Lectures and films on health matters are included in the training programme of the Royal Military Academy and Officer Cadet Schools. Officer Cadets also visit the Army School of Health for lectures, demonstrations and films.

The Role of the Army School of Physical Training

This School makes an important contribution to the health of the Army. The main purpose of the School is to train physical training instructors for units, in which they exert a good influence both on and off parade.

Physical training instructors are able to organize and take physical training classes ; to coach, organize and officiate with regard to athletics ; to coach, organize and judge boxing ; and to play, coach and officiate with regard to swimming and team games. All these activities promote and maintain health, both physical and mental.

In addition, physical training instructors are key men in the Army's arrangements for convalescence, rehabilitation and reconditioning. They carry out a

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great deal of work at convalescent depots, and are mainly responsible for the routine work of conditioning courses. They are advised and supervised by specialists in physical medicine and other medical officers.

Health Education of Recruits

Recruits attend lectures, demonstrations and films on health matters at Infantry, Brigade and Regimental Depots. In all other units, health education is continued and is co-ordinated with training in other subjects.

An important role in the health education of recruits is filled by regimental officers specially trained at the Army School of Health.

Recruits are first taught elementary anatomy and physiology on which are based lessons in elementary personal hygiene. Later they are taught about the causation and spread of disease, on which are based lessons in both personal and communal health discipline.

Health Education of Military Families

Military families are given talks on health matters, particularly those pertaining to maternity and child welfare, at Welfare Centres. In the United Kingdom these centres are operated by the Public Health Services in co-operation with the Army Medical and Welfare Services ; in overseas stations these centres are operated entirely by the Army. An important contribution to the health education of families is also made by health visitors during their visits to the homes of married personnel, both in the United Kingdom and overseas.

Military families travelling overseas receive talks on health matters during the voyage, and are issued with literature specially written for them as an aid to health maintenance in overseas stations.

The Role of Medical Personnel with regard to Health Education in the Army

Administrative Medical Officers

Their responsibilities include the organization and control of health education and the implementation of War Office policies on the subject. In addition, they play an important part in the health education of formation commanders and staff officers ; this they achieve by personal contact, by personal example and by stressing the health point of view at conferences, etc.

Specialists in Army Health

Specialists in Army Health are responsible for all technical matters pertaining to health education in the Army. In addition, they initiate and supervise health education schemes, deliver lectures and give training to unit personnel. Also, when making visits and inspections they make an important contribution to health education by correcting wrong ideas on the spot.

Regimental Medical Officers

The success of health education in the Army depends to a great extent upon the attitude of Commanding Officers, who should derive inspiration and guidance in health matters from their medical officers.

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Much also depends upon junior regimental officers, who must be guided and advised by the medical officer, who does all he can to enhance and continue the health training of other ranks which was commenced at training units.

Medical Officers of Hospitals and Field Medical Units

They are responsible for the health education of the personnel of their units, which must reach an exemplary standard.

In addition, hospitals and field medical units should, by maintenance of a high standard of health discipline and general hygiene, constitute a good example for other units to emulate.

Non-Medical Officers, R.A.M.C.

Non-medical hygiene officers teach practical sanitation and elementary health discipline. Also, they take part in health education schemes as organizers and instructors.

All other non-medical R.A.M.C. officers should, by propaganda and example, co-operate in the general scheme of health education according to the various opportunities afforded by the nature of their employment.

Hygiene Assistants, R.A.M.C.

These men assist Specialists in Army Health and non-medical hygiene officers in the teaching of practical sanitation and general hygiene.

In addition, during their inspectorial work they are able to correct sanitary defects on the spot.

Other Ranks, R.A.M.C. (excluding Hygiene Assistants)

They should assist in health education by being exemplary in their practice of personal hygiene. The importance of health measures will often be judged by the personal attitude and behaviour of medical personnel towards them.

The Role of Formation Commanders and Staff Officers

Formation Commanders should provide the necessary impetus for health education schemes ; without their stimulation and backing no such scheme can be wholly successful.

"G" staff officers control the training policy of the Army, and are thus responsible for seeing that health education and training is given its proper place in training syllabuses.

"A" staff officers are responsible for the disciplinary aspects, and for ensuring that health instructions and orders are obeyed. Also, as they deal with such personal matters as pay, postings, promotions and leave, their actions can have an important effect on mental health.

"Q" staff officers are associated with health matters in many ways, especially with regard to the day-to-day workings of such Corps and Services as the R.A.S.C., R.A.O.C., R.E.M.E., and A.C.C. Thus, within their sphere of activity come such matters as industrial health in workshops and the hygiene of food handling and storage. They are also responsible for policy concerning the

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planning and provision of accommodation, furnishings and equipment scales and schedules ; these matters have their health aspects also.

Role of Regimental Officers and N.C.Os.

Since junior regimental officers are in close contact with the men they are instrumental in maintaining health discipline. They should themselves be trained by their senior officers in all the health aspects of man-management.

Regimental officers give talks and demonstrations to their men on practical health measures, including problems of health maintenance in training exercises, and supervise the health discipline of all under their command.

Regimental N.C.Os. assist the officers in these matters, particularly the maintenance of health discipline by supervision and example.

Methods of Health Education used in the Army

Formal Lectures

The formal lecture is of value mainly for the health education of officers and senior N.C.Os., particularly those who are being trained to teach Army health. Visual aids to such lectures are very helpful ; among those used in the Army are wall-charts, epidiascope illustrations, slides and film-strips.

Lecture Demonstrations

These are used for all audiences, especially for junior other ranks for whom training is required to be as practical as possible.

Informal Talks

Impromptu and informal talks on health are useful for stressing matters of topical importance, and for drawing attention to lessons learned during exercises, etc.

Group Discussions

These are used mainly when a certain amount of basic education in health matters has been completed. Whether such discussions are of any value or not depends a great deal upon the contribution of the "audience" as opposed to the teaching staff.

Playlets

This is a popular method of instruction in the Army and can be usefully adapted for health education purposes. Playlets afford convenient relief from the more stereotyped lectures and demonstrations.

Cinema Films

A large number of films, suitable for a wide variety of audiences, are now circulating in the Army. Their chief value is for propaganda rather than systematic instruction.

Posters and Propaganda Leaflets

These have a place among the material laid out in unit information rooms,

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study centres, libraries, etc. Also suitable posters are prepared for specific situations—e.g., kitchens, workshops, lavatories, medical centres, etc.

Training Manuals and Pamphlets

Manuals and pamphlets are issued to a wide range of personnel. They include the "Manual of Army Health," which is a technical publication intended mainly for medical officers; the "Handbook of Army Health for Regimental Officers and N.C.Os."; a pamphlet entitled "Your Health and You" for individual soldiers; and "Notes for the Guidance of Married Families Proceeding Overseas."

Mobile Teams

These constitute a useful method of health education, particularly for temporary situations, such as Territorial Army camps. A team usually consists of a specially selected and trained Warrant Officer, assisted by N.C.Os.; their equipment includes "set piece" demonstration panels illustrating various aspects of the subject, film-strips, cinematograph apparatus, models and specimens of hygiene equipment.

Road-signs

Special road-signs are used in specific situations, usually to warn troops that they are in an area where particular hazards to health exist—e.g., malaria, typhus, plague, etc.

The Press and Wireless

Increasing use is being made of the Press and Wireless as media for disseminating health propaganda, especially with regard to our forces overseas.

Conclusion

Health education is a major factor in the promotion and maintenance of health in the Army. Its success depends largely upon the efforts and enthusiasm of non-medical personnel, particularly Commanding Officers and junior leaders.

The present organization for health education in the Army is based upon team-work in which every individual, irrespective of rank or mode of employment, has a part to play.

Acknowledgments

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STREPTOCOCCAL TONSILLITIS

An Explosive Epidemic

BY

Captain D. L. GARDNER, M.A., M.B., Ch.B., M.R.C.P.E.

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As a result of many investigations during the past twenty years, the spread of acute streptococcal tonsillitis, and of its twin, scarlatina, among large groups of men living together under barrack-room conditions is now recognized as taking place through the medium of dangerous, symptomless, nose-and-throat carriers and convalescent cases, and by the inadvertent contamination of their immediate environment [1, 2]. The healthy person may, after an attack of tonsillitis, remain for many months a carrier of pathogenic *β-Hæmolytic streptococci*, and in this way perpetuate a high incidence of sporadic tonsillitis among a regimental community, which may include a large number of susceptibles. This endemicity is known to be further perpetuated by the regular introduction into the "universe" at risk of numbers of new arrivals [3] whose resistance to the prevalent streptococcal type may be low. This is in agreement with the results of similar observations on experimental animal populations [4].

During the past ten years several epidemics, involving men of one or other of the national armed forces, have been described in which an explosive outbreak of streptococcal tonsillitis has occurred among a relatively "closed" barrack population [7]. These epidemics have been distinguished by an abrupt onset, a high attack rate, by a low incidence of susceptibles among the remaining population, and by an origin in some article of food. They resemble outbreaks of scarlatina among civil populations, but are necessarily modified by the nature of the population attacked. They have further differed from the low-grade, air-borne epidemics by the apparently minimal virulence of the causative organism, so that cross-infection has been rare, complications few, and the termination of the epidemic sudden and spontaneous. Bloomfield and Rantz [5], who described an epidemic of this type, attributed these peculiar characteristics to massive infection by an organism of low virulence, while Wilson [6] considered that a high incidence of immunes among the population at risk was the more probable explanation.

A further explosive epidemic of the same type is described below.

During the early part of September, 1951, there occurred in a regiment in North Germany an outbreak of acute β-Hæmolytic streptococcal tonsillitis. Of the 265 cases, 203 were seen during the first twenty-four hours. The epidemic was characterized by an attack rate of 35.5 per cent.

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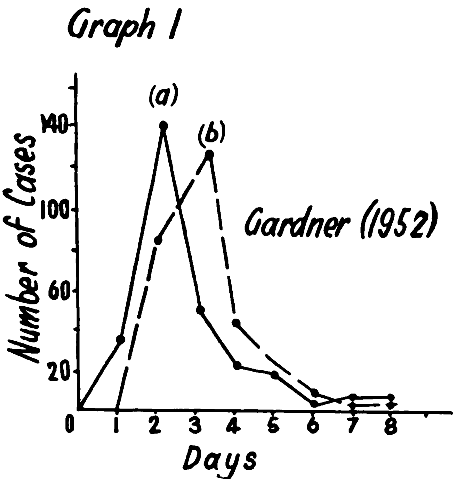
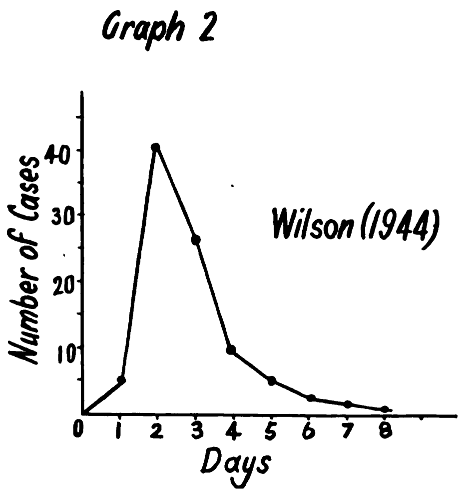
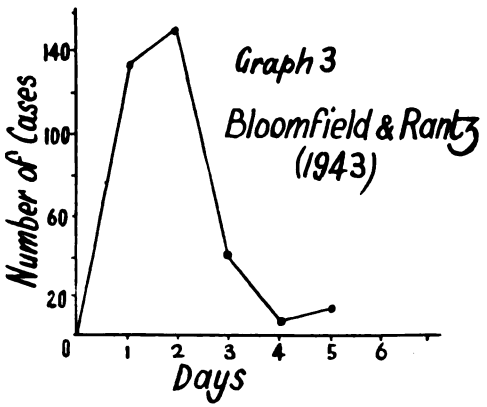
TABLE I.—TIME OF ONSET OF CASES WITH (*a*) THE NUMBER OF CASES FALLING ILL ON EACH DAY AND (*b*) THE NUMBER OF CASES REPORTING SICK EACH DAY

		(*a*)	(*b*)
August	30	4	0
	31	33	1
September	1	136	83
	2	52	120
	3	16	30
	4	13	18
	5	1	5
	6	4	2
On and after	7	6	6
		265	265

The different distribution of figures is accentuated in the graph below.







Comparative graphs indicating the incidence of cases in the three outbreaks mentioned in the text. For tables of figures see Appendix.

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TABLE II.—THE COMPOSITION OF THE REGIMENT ON THE DAY PRECEDING THE OUTBREAK OF THE EPIDEMIC, WITH THE DISTRIBUTION OF CASES ACCORDING TO RANK

	Number	*Tonsillitis*
Officers	29	0
Warrant Officers and Sergeants	61	0
Men	746	265 (35.5%)
Total	836	265

CAUSATION

The causative organism was identified as a Group A *Hæmolytic streptococcus*. During the first day of the epidemic, the organism was isolated in pure culture from 9 of 12 throat swabs taken at random from among the initial 84 cases. Later the same organism was found both in pure and in mixed culture in other random cases. By the third day of the outbreak, when sufficient swabs were available to enable swabbing of every alternate case, treatment with chemotherapy or antibiotics had been started—the results of culture were thereby invalidated. In view of the almost identical clinical picture, there can be no reasonable doubt that one strain of streptococcus was responsible for the entire outbreak.

Some authors have reported sulphonamide resistance among the streptococci.

CLINICAL FEATURES

Of the first 100 cases seen, the majority complained of sore throat, preceded by malaise, shivering, pains in the back and limbs, sweating, and pain in the neck. Less common symptoms included lower abdominal pain sufficiently severe to simulate acute appendicitis, occurring on the third day of the illness, mild meningism, chest pain, and mental disorientation. The majority of these symptoms were transient, but in one sporadic case seen shortly before the epidemic, continuous abdominal pain persisted with a normal temperature for five days.

Each of this initial group of patients had a high temperature, and was prostrate with malaise and the fatigue resulting from a night exercise. The tonsils were universally and grossly enlarged and covered by discrete follicular exudates, or by large ulcerated areas. Those cases who had had a previous tonsillectomy presented with a diffuse pharyngitis. Each case had local glandular enlargement of greater or less degree. The tonsillar glands were primarily involved, and generalized lymphadenopathy was not observed. The degree of glandular enlargement was not always an accurate reflection of the severity of the infective process. Those cases with ulcerative lesions of the tonsils appeared to suffer less pain than those with follicular exudates.

Later in the epidemic, the clinical picture became modified as cases of early or mild tonsillitis tended to report sick, and a complaint of sore throat was often unaccompanied by other symptoms. The temperature in these mild cases was seldom raised above 99° F.

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It was possible on the basis of the severity of symptoms and signs to classify all cases into three broad groups. These groups represented (1) mild or abortive cases with few symptoms, a minimal rise in temperature and few signs; (2) a large group with well-marked bilateral follicular tonsillitis, glandular enlargement, and temperatures of 100° F. and above; and (3) those cases of greatest severity—e.g., with peritonsillar abscess or swelling, with temperature of 104° F. —and those cases with marked or prolonged systemic disturbance.

Of the 265 cases seen, 40 admitted to previous attacks of tonsillitis. The relative incidence among those who had undergone previous tonsillectomy was not determined.

Epidemiology

The epidemic involved a regiment of 836 men (Table II). Of these 29 were officers, and 61 warrant officers and sergeants. During the period from one week prior to the beginning of the epidemic to one week after its termination, there were no cases of tonsillitis among the two latter groups. The outbreak was therefore entirely confined to those men of corporal rank and less. The infection, however, did not appear to involve any one group of men either geographically, according to the position of their sleeping quarters, or chronologically, according to the time of their duty hours. The incidence of cases among the men was entirely random and was not limited to any single battery.

The significance of these observations is enhanced when it is noted that during the probable incubation period—i.e., 24-48 hours prior to the time when the majority of cases fell sick—both officers, warrant officers, sergeants and men were mixing freely on a night exercise.

The vehicle of infection must in other words be traced to a source common to all men in the regiment, but not to the officers, warrant officers, and sergeants. This source must be of such a nature as to offer a reasonable explanation of the simultaneous infection of large numbers of men.

Food and milk are recognized [5, 6] as being the probable sources of explosive epidemics of streptococcal tonsillitis, and in the epidemic described here these articles were again suspect. From the facts mentioned previously, airborne infection can be excluded, and a consideration of the way in which the epidemic started leads to the inescapable conclusion that a food or milk source was the cause of the epidemic.

Such a mode of spread presumes the contamination of food or milk by a healthy carrier or convalescent case. In other epidemics the nasal carrier has been cited as the dangerous excretor, particularly when suffering from acute upper respiratory disease. In the kitchen he may contaminate food or milk directly (particularly dangerous when the food or milk is allowed to stand long at a near-body temperature, permitting the organisms to multiply). Attention was, therefore, directed to the main kitchen and to the kitchen of the Naafi canteen. In the former it was observed that milk was prepared from powder or released from tins—the precautions observed to keep the milk clean were, however, adequate, and it was at once refrigerated. Containers were adequately washed but not sterilized. Food was handled freely by a total of thirty cooks. At the time of the

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epidemic two of these had finger infections, and four had had sore throats during the preceding month—of these men one had had four attacks of sore throat in the preceding three months. Swabs from all four, however, revealed no pathogenic streptococci.

It was further observed that when the times of these attacks of tonsillitis among the cooks were plotted, an almost continuous period of one month was represented. That is to say, for four weeks prior to the main epidemic there had been a low-grade but continuous incidence of sore throat among the cooks.

Cook 1	13.8.51—18.8.51
Cook 2	17.8.51—20.8.51
Cook 3	24.8.51—27.8.51
Cook 4	29.8.51— 2.9.51

Although this does not prove that a cook was indeed the source of infection, it is thought to be significant.

The conditions in the Naafi canteen were also investigated. Four civilian cooks were employed, none of whom had suffered from any form of upper respiratory disease during the preceding four weeks. Facilities for washing were adequate and the general standard of cleanliness high.

Predisposing Factors

Although some observers have postulated that an explosive outbreak such as this is caused by a massive dose of organisms of low virulence, it is tempting to assume that in this epidemic the passage of streptococci from one cook to another over a period of a month produced a strain of high local virulence but with a minimal capacity for spread. Proof of this is, however, lacking.

The resistance of the exposed population is another point having some bearing on the attack rate. The men had recently arrived from England, and were perhaps being exposed to an organism to which they lacked any acquired immunity, however little. Again, the men had been taking part in a strenuous night exercise ; fatigue and sleeplessness may further have lowered their natural resistance.

These points are essentially speculative.

Treatment [7, 9, 10, 11, 12]

Cases were treated by one of three methods.

Table III.—Number of Cases treated by each Method, with the Average Time in Days spent in Hospital

	Number	*Average time in hospital*
Penicillin	108	6.2 days
Sulphamezathine	124	6.3 days
Penicillin and sulphamezathine	6	
Gargles and aspirin	33	8.2 days

This latter figure bears no direct relationship to the rapidity of response to treatment.

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Of the initial 100 cases, one-third received saline gargles and 10 grains of aspirin every six hours ; one-third received 1 gm. of sulphamezathine every six hours ; and the remainder penicillin, once daily. While supplies were sufficient, penicillin was given in the form of a procaine and soluble mixture, to a total of 400,000 units per ml. Later one large dose (1 mega unit) of soluble penicillin once daily was used. Treatment continued in each case for five days. The progress of each case, and the condition of the throats, were reviewed daily by a medical officer. Temperatures were recorded once daily. Cases in whom the response to treatment was delayed more than five days were given the supposed benefit of penicillin in addition to whatever other treatment they may have been having. It was not felt justifiable to withhold the use of specific drugs longer in severe cases.

Those who developed peritonsillar abscesses were likewise given penicillin, as were those who displayed any of the toxic reactions to the sulphonamide drugs.

The later group of 165 cases was divided at random into those receiving penicillin and those having sulphamethazine.

By error, six cases received both penicillin and sulphamezathine (Table III).

A full account of this trial of methods of treatment will be published later. Meanwhile the impressions gained as to the relative efficacy of each of these three methods are given below. It is emphasized that these impressions are without statistical authority, and do not provide an adequate basis for planning the treatment of future outbreaks.

The consensus of opinion formed from these results favours the use of penicillin for the average, moderately severe (Group 2) case of acute hæmolytic streptococcal tonsillitis. This opinion is based on the following points :

(1) Penicillin relieves the symptoms and subjective phenomena of the illness rapidly.
(2) Penicillin lowers the temperature quickly.
(3) With penicillin, recurrence of infection is rare, complications both of the infection and of the drug uncommon.
(4) One injection daily for four or five days is adequate.

Sulphamezathine is easier to give, and does not carry with it the risk of disease transmitted by a contaminated syringe. For treating the case of Group 2 severity it has, however, the following disadvantages :

(1) It relieves symptoms less quickly than penicillin.
(2) The infection is controlled less rapidly.
(3) Complications both of the infection and of the drug therapy are more common than with penicillin.
(4) Recurrence of infection is not uncommon.

The average period of sickness, however, for cases treated by these two rival methods does not differ significantly.

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The use of saline gargles and aspirin in this type of case has nothing to recommend it: there was little subjective relief, the tendency to relapse was common and complications of the infection frequent.

The impression gained from the treatment of these cases has, therefore, upheld the suggestion that penicillin is the drug of choice in treating the moderately severe case of streptococcal tonsillitis, and that one injection daily is enough to prevent the likelihood of recurrence or relapse.

For the severe (Group 3) case, for the recurrent case or for those with peritonsillar abscess, this dosage of penicillin is probably minimal.

For the mild (Group 1) case either penicillin or sulphamezathine may be used and the results obtained are almost equally as good with either drug. Again, recovery of a mild case will usually take place rapidly when treatment is with saline gargles and aspirin tablets, but the tendency to relapse is greater than with the other methods of treatment and complications more frequent.

Complications

Table IV.—The Incidence of Complications of all kinds according to the type of treatment used, expressed as a Percentage of the total number receiving each form of Therapy

	Gargles and Aspirin Per cent.	*Sulphamezathine Per cent.*	*Penicillin Per cent.*
All complications	27.0 [9]	8.0 [10]	4.6 [5]
Peritonsillar Abscess	8.8 [3]	1.6 [2]	0.9 [1]
Recurrence	2.9 [1]	4.8 [6]	0
Earache			
Herpes Febrilis	9.0 [3]	7.5 [9]	6.5 [7]
Drug complications	0	0.8 [1]	0

(*a*) *Of the Disease*

Among the 265 cases there were 6 of peritonsillar abscess: 3 of these occurred among the men treated with gargles and aspirin (9 per cent.), 2 among the cases treated with sulphamezathine (1.6 per cent.), and one among the penicillin treated cases. In a further 7 cases recurrence of the infection took place two to seven days after discharge from hospital. These represented 2.9 per cent. of the gargle and aspirin treated cases and 4.8 per cent. of those having sulphamezathine. There were no recurrences among those having penicillin initially.

No cases of nephritis or of rheumatic fever were observed. This was in agreement with observations on previous similar outbreaks.

Nineteen men developed herpes febrilis. The incidence bore no relation to the type of treatment used.

Although two men complained of pain or deafness in the ear, there were no manifest cases of otitis media.

Meningism was noted in 3 cases.

(*b*) *Of the Drug Therapy*

In the absence of adequate skilled nursing attention, the fluid intake of sulphonamide-treated cases was probably minimal. One man developed

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bilateral loin pain with temporary oliguria. He was treated by a restricted fluid intake of 1,000 ml. daily, and was transferred from sulphamezathine to penicillin. Recovery occurred rapidly.

Lessons of the Epidemic

It has been shown repeatedly that even in these relatively enlightened days one dangerous symptomless carrier of pathogenic organisms can still cause an immense amount of harm. In this epidemic at least, 2,000 working days were lost, the entire organization of the regiment upset, and the annual manœuvres threatened. It is emphasized that this might have been avoided had health-consciousness been more dominant among the kitchen staff.

There is in fact great need for closer co-operation between kitchen and medical staffs ; the significance of any minor symptom should at once be questioned. Kitchen staffs would do well to study the comprehensive medical organization employed by several large civilian caterers.

The control of such an explosive streptococcal epidemic is simple. These outbreaks we now know to be self-limiting, and it is sufficient merely to prevent [7] contact with the outside population and the grosser degrees of contact between patients and those not attacked, who are for the most part those whose resistance is high.

All infected cooks should be most carefully observed and three consecutive negative nose and throat swabs obtained before work is resumed.

Summary

1. The mode of spread of epidemic streptococcal infections is mentioned. It is noted that during the past ten years several explosive food-borne epidemics of streptococcal tonsillitis have occurred.

2. A further explosive tonsillitis outbreak affecting a regiment is described—36 per cent. of the men in the regiment were involved.

3. The causative organism was a *β-Hæmolytic streptococcus*.

4. The main clinical features are described—cases are classified broadly into three grades of severity.

5. The outbreak was limited entirely to those of corporal rank or below—reasons are given for believing the epidemic to have originated in the kitchen, probably from a cook.

6. Factors which may have lowered the resistance of the exposed population are described.

7. Treatment was by one of three methods—penicillin, sulphamezathine, or gargles and aspirin. Their relative merits are discussed, but not submitted to statistical analysis.

8. Complications are mentioned—their incidence in the different treatment groups is given.

9. Lessons to be learned from an outbreak of this type are detailed. Emphasis is laid on the necessity for improved co-operation between medical and kitchen staffs.

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APPENDIX

Occurrence of Cases in Previous Epidemics

1. Bloomfield and Rantz (1943)

Day	1	135
	2	156
	3	37
	4	5
	5	8
	6	0
Total		341

2. Wilson (1944)

Day	1	4
	2	42
	3	25
	4	8
	5	5
	6	2
	7	2
	8	1
Total		89

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Corrigendum

Studies on Urinary Carriage of Enteric Group Organisms II: Classification of Urinary Carriers, and the Diagnostic Value of Urinary Antibody Tests.

Vol. XCVIII, No. 3, March 1952, page 191:

Table X: For "23" opposite "Totals" and under "Heterologous" (in column 10) substitute "14(23/164)."

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AN ATTEMPT TO MODERNIZE INDIAN CANTONMENT SANITATION

During 1940-41 the Indian Army was expanding rapidly. Accommodation had to be provided for a new Infantry Division being formed at Delhi. The Division being completely mechanized, no litter was available, so the usual method of disposal of excreta by incineration was not possible.

At the original District Headquarter Conference "Q" and "E" could only suggest the old Croly cart and removal to a distant trenching ground. Having seen Hopper Septic Tanks (for which the present Editor of the Journal was responsible) working at Sialkote, I managed to persuade our G.O.C. to accept these and get on with construction of two such per battalion camp, even if the living accommodation was to be tented or temporary hutted.

I had hoped that the hopper tanks would be completed before the camps were occupied, but my hopes were not realized throughout, and Croly carts had to be used for some camps and the night-soil removed to a trenching ground during the witching hours of night or when night's candles were burnt out and jocund day stood tip-toe over The Ridge, as Shakespeare might have said.

I visited the camps at least twice a month from Dehra Dun to stimulate the work in camp, accompanied by the S.E.M.O., a very distinguished officer of the Corps and later to be D.D.M.S. of an Army, and visited the battalion camp when the last two septic tanks were completed, by appointment. On asking the C.O. Battalion, a Gurkha one, how these were working we were told they were not satisfactory ; they smelt. I said how could that be ; similar installations in the other two camps of the Brigade are satisfactory during the last two months ; there must be something wrong in their construction. Arriving at one latrine area, there was no doubt about the smell, but most of it came from behind the latrine where the Croly cart was being used as a receptacle during the day. The septic tank appeared correctly constructed, but no sweeper was available to open the doors to view the inside. Such was the custom of the country that *only a sweeper* could handle the doors. We walked across to the other flank to the other group latrine. The Head Sweeper was present. Placing the emblem of office under his left axilla, he clicked his heels and saluted smartly. I asked, "Does not this 'machine' work satisfactorily ?" He replied, "No, Sahib ; it smells." I said, "Open those doors ; I want to see what is wrong inside." There was a wild rush from the septic tank by another sweeper who emerged, tripping over tins.

The open doors revealed a completely unused underground chamber, with the sweeper's bedding and unexpended rations collected from company kitchens. The sweeper had found a comfortable basement dwelling protected from all weathers, while the rest of the troops were making the best of a tented existence.

There were the C.O., Quartermaster, Subedar-Major, Jemedar Quartermaster, Sanitary N.C.O., S.E.M.O., and A.D.M.S., but alas ! no Bateman to illustrate the incident.

H. J. M. C.

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THE TRANSMUTATION OF ENERGY AND MATTER

BY
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Royal Army Medical Corps
Member of the Society of Radiographers
Instructor in Physics at the Army X-Ray School

THE idea of mass becoming a function of energy was a direct result of the relativistic theories by Einstein in 1905. Little must he have thought at the time how momentous his theories and their practical applications were to become within the same half-century. The exploding of the atom bomb over Hiroshima and Nagasaki in 1945 heralded a new era for *homo sapiens* and, incidentally, a

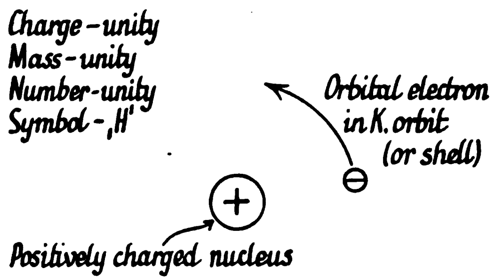

FIG. 1
ATOM OF HYDROGEN.

serious challenge to contemporary medical science. Einstein's calculations, first based on the results of observations on the characteristics of light, demonstrated the rather startling fact that the mass of a particle increased with its velocity.

The change in mass with velocity was confirmed by the experiments of Kaufmann, who proved that a charged particle emitted from the disintegration of radioactive substances increased in mass as the velocity increased. This increase in mass of a charged particle is actually an increase of energy in the surrounding magnetic field. From the above consideration of the transmutability of mass and energy, we proceed to the study of matter itself and consider the energy residing in the atom as mass.

The original idea that an atom consisted of a round marble-like core, surrounded by smaller marbles, revolving like the planets around the sun, has not been held for some time, but it served its purpose as a stepping-stone to new and

rather more logical conceptions. First and foremost, the hydrogen atom is now thought to be the "brick" of the Universe, and from which all other elements are composed, as all other atomic structures seem to be just multiples of the fundamental hydrogen atom. This atom comprises a nucleus, or a positively charged particle called a proton and an extra-nuclear negatively charged particle called an electron. The charge on the proton is exactly equal and opposite to that of the

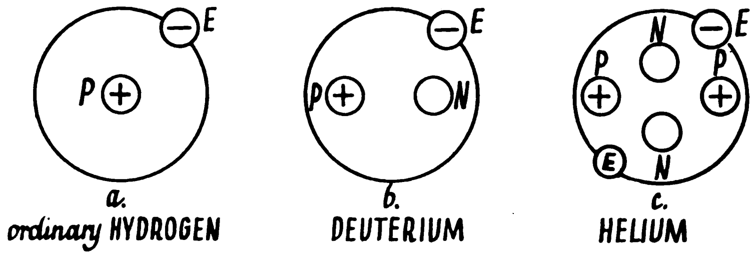

FIG. 2

electron, thus giving the atom a state of electrical equilibrium. However, the mass of the proton is nearly 1,840 times that of the electron. Thus, although one may form a mental picture of the atomic structure according to the individual sense of imagination, science is just as imaginative, for the fact is, that a true mental picture has not yet been formulated, and it is doubtful if one ever will be, as the hope of being able to form such a picture seems to be receding as more knowledge is gained.

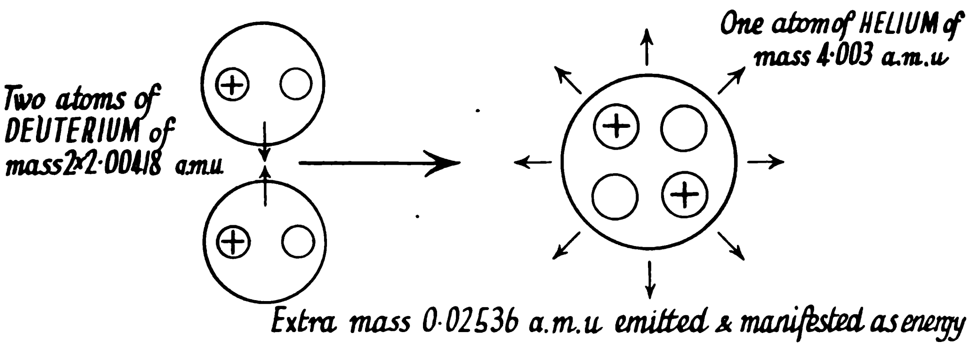

FIG. 3

THE TRANSMUTATION OF ATOMIC MASS TO ENERGY.

Although the electron does possess mass, the weight of the hydrogen atom is taken as the weight of its nucleus, or proton, the difference in mass being so great. Thus for convenience the weight of the hydrogen atom is taken as unity. Scientific research during the past few years has discovered that in a quantity of hydrogen 99.98 per cent. of the atoms consist as stated, of a proton nucleus and an extra-nuclear electron, but what of the other 0.02 per cent. ? This small fraction has

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been found to consist of atoms possessing one extra-nuclear electron, but of mass twice that of the majority of hydrogen atoms. As these atoms are stable, that is, in electrical equilibrium, the nucleus must contain one proton, yet their mass is such that "something extra" must be in the nucleus. This "something extra" has been shown by Chadwick to be particles of mass equal to that of the proton, but possessing no electric charge whatsoever, and, aptly, they are called neutrons.

One may ask if the atom of hydrogen which contains this extra mass is so much different from the hydrogen atom which does not, and the answer is that chemically there is practically no difference, but physically there is a great difference. A very important fact can now be stated—that is that the extra-nuclear electrons (and not the nucleus) decide the chemical characteristics of the atom. This "heavy" hydrogen atom possesses but one electron and one proton and so its "atomic number" is unity, although its atom weight is 2. This brings

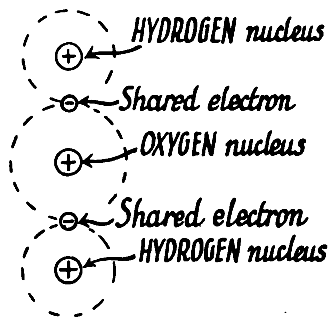

Fig. 4
Molecule of H_2O.

us to atomic numbers, which are easily understood when it is seen that the number of charges in the nucleus or the number of extra nuclear charges in the stable atom give the atomic number. Thus the atomic number of hydrogen is unity, the atomic number of oxygen is 8, oxygen possessing 8 protons or 8 extra-nuclear electrons, and so on right up the atomic table to uranium, which has an atomic number of 92. Symbolically the atom of hydrogen is given as ${}_1H^1$, that of oxygen as ${}_8O^{16}$, the suffix at the foot of the symbol being the atomic number, and the superfix at the head being the atomic weight.

To return to "heavy" hydrogen, it *is* hydrogen, and acts chemically like hydrogen. In fact, right up the atomic scale it is found that other elements possess these heavier "brothers." For example, oxygen possesses three, ${}_8O^{16}$, ${}_8O^{17}$, and ${}_8O^{18}$, whilst the uranium family is very large. These varieties of the same element are called "isotopes," and in fact the isotope of hydrogen ${}_1H^2$ has even got a special name—"deuterium."

Helium, which possesses a nucleus consisting of two protons and two neutrons and of course two extra-nuclear electrons, is symbolically ${}_2He^4$, whilst the heaviest atom of all, uranium, of atomic weight 238 and number 92, possesses

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some 146 neutrons. The nucleus of this atom is exceedingly unstable and continually flings out particles consisting of two protons and two neutrons; in fact, helium nuclei, an exceedingly stable formation, ***given the name of alpha particles***, which leave the nucleus with tremendous velocity. This activity of the nucleus is common to all the elements with a higher atomic number than 82. Actually this activity, called "radio-activity," is a highly complicated procedure involving interchanges of energy inside the atomic nucleus, and we will not dwell too much upon its ramifications except to note the external manifestation of nuclear energy. It should be noted that the atomic nucleus consists of positive charges and neutrons and that "like" charges repel each other (consistent with the law of electrostatics). How then is the atomic nucleus held together, usually with such tremendous force? The answer to this must await further investigation into atomic structure.

If these alpha particles emitted by radio-active substances are utilized to bombard nitrogen gas, the nitrogen atom is disintegrated as follows:

$$_{7}N^{14} + {}_{2}He^{4} \rightarrow {}_{1}H^{1} + {}_{8}O^{17}$$

—and two different elements, hydrogen and an isotope of oxygen, are formed. Nuclear transmutations may be achieved by any atomic particles possessing the requisite energy. Positive ions (or protons) may be given tremendous energy by means of a device called a "cyclotron." This device consists of sending the charged particles through strong magnetic fields which apply the requisite resonant "push" at intervals, thus imparting to the particle a tremendous velocity. By bombarding various elements by these particles, fast or slow transmutation may be made to take place, and some elements may be made into isotopes of a new element which are unstable and radio-active; these may be used in many ways by both industry and medico-biological research in the form of "tracers." This, however, is a digression.

By means of an instrument called a "mass spectroscope," a mass spectrograph may now be obtained which, on interpretation, indicates differences in atomic weights compared with those values previously held. The results are of interest, and the relative masses of the elements computed show that the atomic weight of hydrogen relative to oxygen (16.0000) now becomes 1.0080, that of helium 4.003, and so on to uranium of atomic weigh 238.07. Suppose that we could take two atoms of heavy hydrogen or deuterium and build up an atom of helium, then, taking the atomic weight of deuterium to be 2.01418 on our new scale and the atomic weight of helium to be 4.003 in the same scale, we have a discrepancy.

$$2 \times 2.01418 = 4.02836 \text{ and } \textit{not } 4.003.$$

This discrepancy is too large for it to be due to experimental error and, in fact, similar discrepancies occur if we theoretically make up oxygen from our hydrogen isotope. This difference in mass (in the above case 0.02536 atomic mass units) can be calculated in terms of energy from Einstein's equation, $E=mc^2$, where E is the energy represented in ergs, m the mass in grams, and c the velocity of light (3×10^{10} cms. per sec.). (See Appendix.) To gain some idea of the

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amount of energy represented by even a small mass, such as 0.001 grams, the substitution of 0.001 grams in the energy equation gives a value:

$$E = 9 \times 10^{17} \text{ ergs.}$$

This value is approximately equivalent to 33,000 horse-power hours, whilst one gram of matter is equivalent to 9×10^{20} ergs, or approximately 1,000,000 horse-power for 33 hours (the total output of Niagara Falls for 33 hours). Oxygen atoms consist for the majority of eight neutrons, eight protons, and eight extra-nuclear electrons, yet the mass of the oxygen atom is less than four times as heavy as the helium atom. The explanation in short is that as hydrogen atoms are built up into more complex structures, a rearrangement of the electrical field inside the atom must take place; this is known as the "packing effect." Mass is given up as energy, and the mass converted into energy gives us some idea of the binding energy of the nuclei. For example, if we wished to dissect a helium atom and make two deuterium atoms from it, we should have to use the amount of energy represented by that mass lost in the building of the helium atom—i.e. 0.02536 atom c mass units, per atom.

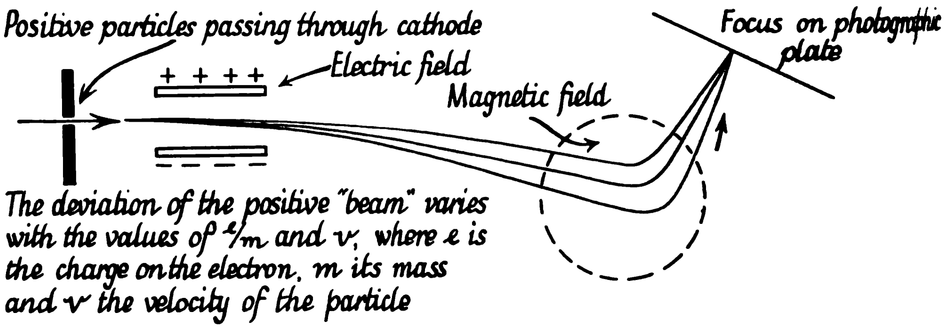

FIG. 5

MASS SPECTROSCOPE.

The earth is continually being bombarded by a radiation from outer space given the name "cosmic radiation," the exact origin of this radiation being at the moment a matter of speculation, but the energy of this radiation is such that nothing short of the building of a universe could explain it. If, under certain conditions, hydrogen is being built up into complex atoms in some remote "building plot" in space, the mass difference released as energy is awe-inspiring even to modern science. In the sun and stars, hydrogen is probably being transmuted into helium and into elements of still higher atomic weight and number, the release of "mass energy" being responsible for the continued radiation of electro-magnetic origin. Scientific progress has recently brought us to the conclusion that if we could emulate the sun and manufacture helium from hydrogen, a new and vast store of energy could be released. The transformation of hydrogen into helium, or even into oxygen (with still greater mass release),

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would take place if the conditions were propitious. These conditions are, in effect, heat and pressure equivalent to that of the sun's interior, a rather ambitious project, but evidently not too ambitious for the modern scientist.

In 1939 Hahn and Meitner found that when the uranium atom is bombarded with neutrons, the nucleus splits up into roughly two equal parts with great release of energy. As a matter of fact, neutrons are very convenient "bullets" for this bombardment, because, being electrically neutral, they are not attracted or repulsed by positive or negative charges and, of course, their mass is equal to that of the proton. Now, if the uranium nucleus is split, what happens ? Where does the energy come from and what remains ? Natural uranium contains two main isotopes, 238 and 235—that is, the isotope 235 possesses 3 neutrons less than uranium 238. As the nuclei split there occurs a discharge of energy, the "binding energy," of the particle, manifested in the discharge of heat radiation, fast neutrons, alpha particles, beta particles (negative charges) and a radiation of photons (or quanta of electro-magnetic energy) of great power called "gamma radiation." It was discovered that the isotope 238 was disintegrated by fast neutrons and not by "slow" neutrons, whereas the isotope 235 was disintegrated by either fast or slow neutrons. Now, if the uranium atomic nucleus is split by the bombardment of neutrons, more neutrons are generated, but these neutrons will *not* in their turn disintegrate the nuclei of isotope 238, but will disintegrate the nuclei of the 235 isotope. Suppose that the 235 isotope be separated from the 238 isotope, then what happens ? This is exactly how the research progressed. A salt of uranium was vaporized and passed through the powerful magnetic field of a huge cyclotron, the particles being made to describe a circular path by the electro-magnetic forces acting. The heavier isotope, 238, described a different path from that of the 235 by reason of its different mass, and was collected. The 235 isotope was now bombarded with neutrons of "thermal speeds" (or speeds comparable with those of heated gas molecules), these speeds being obtained by allowing the neutrons to make collision with the lighter atoms of deuterium (or heavy hydrogen). A "chain reaction" was initiated ; that is, as bombarding neutrons disintegrated the uranium nuclei, other neutrons were liberated, which in turn disintegrated other nuclei and so on. As the isotope ${}_{92}U^{235}$ split, it formed two more isotopes, ${}_{56}Ba^{138}$ (Barium) and ${}_{36}Kr^{86}$ (Krypton), which accounts for 132 neutrons ; but the isotope 235 contains 143 neutrons. The extra 11 neutrons split other nuclei, releasing 11 at every reaction and so on. The artificial separation of the 235 and 238 isotopes of uranium is a long and slow process and has other disadvantages, but it was found that if ${}_{92}U^{238}$ was bombarded with neutrons, another isotope—${}_{92}U^{239}$—was obtained. This isotope is radio-active (as are all elements of high atomic weight) and gives off a "negative" charge called a "beta particle," an interchange of energy in the nuclear field causing a radiation to acquire negative characteristics. This discharge of negativity causes the positive charge of the nucleus to increase by 1, thus giving us a new element, for another extra nuclear electron will attach itself to the atom —i.e. $${}_{92}U^{239} \rightarrow {}_{93}Np^{239}$$

The Np stands for neptunium, a new element to which the above name has been

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given. Now neptunium, also radio-active, in its turn gives off a beta particle, and we get a new element again, called plutonium ($_{93}Pu^{239}$).

$$_{93}Np^{239} \rightarrow {}_{94}Pu^{239}$$

The plutonium, as is seen, collects an electron from the surrounding matter, there being plenty of free electrons (or ions) in all matter. Actually, in the latter transformation gamma rays are emitted as the nuclear field reorientates itself. Now this element plutonium can be separated from uranium by chemical means (for after all it is an element in its own right), and so is relatively easy to obtain.

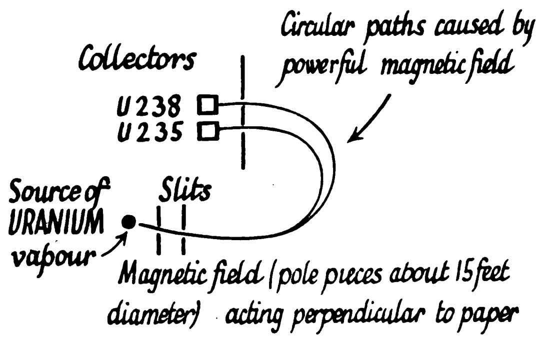

FIG. 6
CYCLOTRON OF CALIFORNIA UNIVERSITY.

If plutonium is bombarded with neutrons, a chain reaction acting in practically instantaneous time causes such a rapid release of energy that it constitutes a violent explosion. However, another difficulty arises, for in the sphere of plutonium the amount of neutrons generated in the mass of the sphere will vary with the cube of the radius (volume of a sphere being $^4/_3\pi r^3$), whilst the loss of neutrons being emitted from the surface is proportional to the square of the radius (area of a sphere being $4\pi r^2$).

Thus if the sphere is too small, the loss of neutrons will be greater than their generation, and if the sphere is too large, the absorption factor becomes too great, and so the correct size of mass must be obtained if nuclear fission is to be effected satisfactorily. This size is called the "critical size," and two particles, together making the critical size, can be brought together at any desired time to cause the instantaneous reaction and explosion. The speed of each fission neutron is in the order of 10^{10} cms. per second (about one-third that of light), and the time taken to cause considerable disintegration of the mass is in the order of millionths of a second. Every gram disintegrated releases an energy equivalent to thousands of tons of T.N.T., with consequent heat emission of millions of degrees and pressure of many millions of atmospheres. Therefore the heat and pressure required for the building up of helium, nitrogen or oxygen from hydrogen or lithium can be obtained. In fact, science now possesses the "fuse"

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for the release of unimaginable energy, and it is perhaps ironic that the first use made of this energy should be in the form of a "hydrogen" or "oxygen" bomb.

The energy emission from this "bomb" would be in the form of heat, light or radiation, the radiation being, it is presumed, of very penetrating gamma rays, but not as penetrating as cosmic rays, whose energy would presumably be in ratio to the building up of heavier atoms. However, these gamma rays would be of such penetrability that the protection factor against radiation would assume a

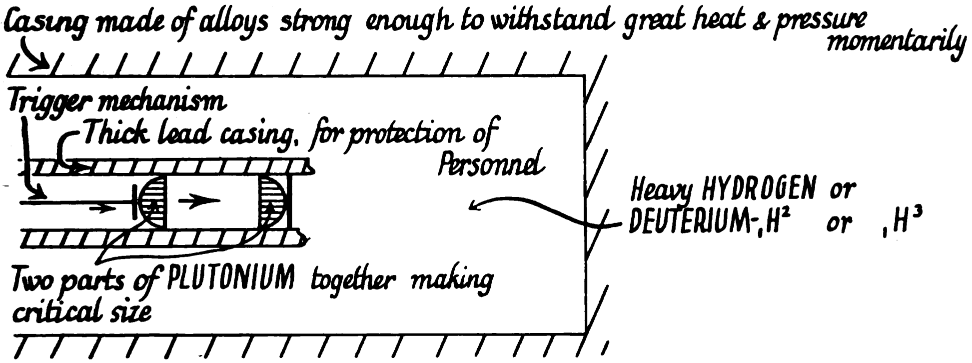

FIG. 7

greater significance than hitherto, and in fact it must be a matter of grave speculation if any surface protection could be efficiently devised. The heat energy emitted would cause instantaneously a blast of hot gases extending for a radius of several miles—the height above the ground for the explosion of the bomb being calculated so that the blast would have a maximum tangential force. The extent

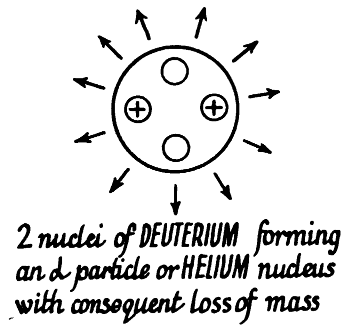

FIG. 8

of the energy release could presumably be made to vary—in fact, the main limiting factors at the moment must be the engineering facilities necessary for the production of the components and the obtaining of the necessary heat-resisting materials. Graphite is probably utilized, but even this element sublimates at 3,500° C. However, in the not so distant future, when heavier elements are built by artificial means, the tremendous energy release may be utilized for more constructive purposes, but again that is another story.

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I wish to thank Lt.-Col. T. M. Corcoran, Adviser in Radiology to the Army, for his valuable assistance and permission to forward this article for publication.

APPENDIX

The transmutation of mass and energy was anticipated by J. J. Thompson, Heaviside and Larmor, but it was the experimental observations of Michelson and Morley which gave Einstein the basis for his calculations on the special theory of relativity.

During the course of experiments with light, it was found that any change in the motion of an observer did not produce any change in the velocity of light as measured by the observer.

FitzGerald contended that the apparatus measuring or recording a change in the relative velocity of the light contracted by the ratio $\sqrt{1-\frac{v^2}{c^2}}$ where v is the velocity of the apparatus and c that of light. This ratio is known as the "FitzGerald contraction."

The mathematics defining the theory of the matter energy transformation involve the conception of a four-dimensional vector, but, using the results of a simple integration, the following can be readily understood :

Let m represent the mass of a particle at velocity v, and m_0 the mass of the particle at rest, then if c is the velocity of light (at a constant value of 3×10^{10} cms. per second).

$$m=\frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$$

It can be seen from this equation that as the velocity of a particle approaches that of light, the mass of the particle approaches infinity, and, again, it demonstrates the fundamentality of the velocity of light. Substituting relativistic functions in Newtonian dynamics: Let W be the work done on a particle of mass m, then it can be demonstrated that—

$$W-mc^2=K \text{ (constant)}$$

When the body is at rest, $W=O$, $m=m_0$, so that $K=m_0c^2$

$$\therefore\ W=c^2\,(m-m_0)$$

From the first equation, $W=m_0c^2\left(\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}-1\right)$

In the case where v is relatively small $\frac{1}{\sqrt{\left(1-\frac{v^2}{c^2}\right)}}=\left(1-\frac{v^2}{c^2}\right)-\frac{1}{2}$

Using the Binomial Theorem $\left(1-\frac{v^2}{c^2}\right)-\frac{1}{2}=1+\frac{1}{2}\frac{v^2}{c^2}+\frac{3}{8}\frac{v^4}{c^4}+\ldots$

Neglecting $\frac{v^4}{c^4}$ and higher powers,

$$W=\tfrac{1}{2}m_0\,v^2$$

Now W can be considered to be the kinetic energy of the particle, and an increase in kinetic energy can therefore be regarded as an increase in mass $(m-m_0)$.

$\therefore$ $E=mc^2$, where E is the energy in ergs and m the mass in grams.

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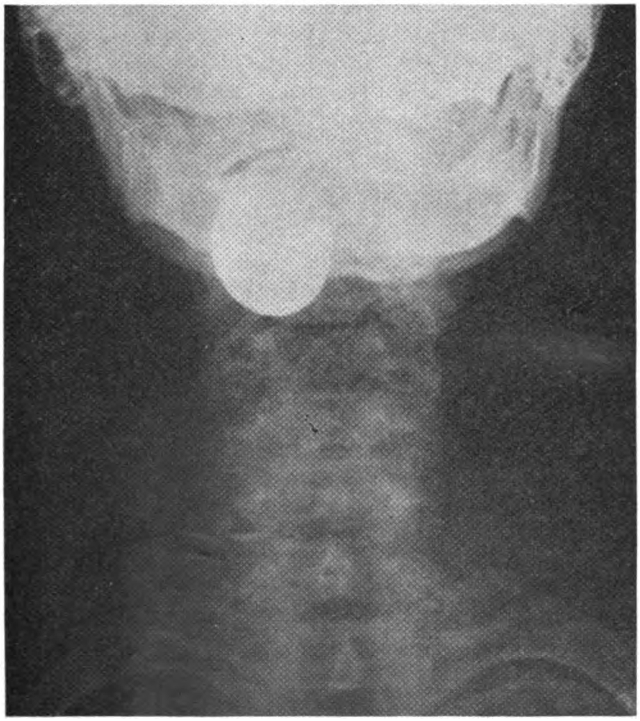
SELF-INDUCED LATERAL PHARYNGEAL DIVERTICULA

BY

Colonel M. MORRIS (Retd.)

PHARYNGEAL diverticula of traumatic origin are quite common amongst habitual convicts in the Central and United Provinces of India. It must be remembered that these convicts are criminal by birth, nomadic by habit and similar to our conception of gipsies.



X-RAY PHOTOGRAPH WITH COIN IN POUCH

The diverticula are self-inflicted, generally unilateral though I have seen a few bilateral. The man can hide up to 15–20 rupees in them—or other articles of jewellery or precious stones of a similar size. They of course vary in size and also tend to become smaller when not in use. The diameter of an Indian rupee is about 1 inch and it is made of nickel and Indian silver and has a rough edge. It would appear that these pouches are made with a piece of lead about the size of a

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pigeon's egg which is placed in the tonsillar fossa at bed-times. The lead has a hole through which a piece of silk is passed and brought outside the mouth and tied to the ear to prevent it slipping into the œsophagus. The lead causes ulceration in the fossa with destruction of tonsillar tissues. The convict takes out the piece of lead in the morning and puts it back again during the night and goes on doing this till the pouch is formed. The ulceration gradually heals and the pouch is kept open by the convict putting his finger in it, rubbing it and generally enlarging it. Coins are concealed day and night and can, in some cases, be retained during meals. Gold coins are said to make better pouches than silver ones and cause less reaction.

The convicts state that the pouches take from fifteen to twenty days only to make. Headache and referred pain is often complained of whilst the pouch is being made. Great stress is made by these men that the pouches should be made in July and August at the height of the Indian hot weather when, they say, the tissues are loose and lax. Articles are removed by tilting the head forward and an effort like vomiting causes them to be ejected.

It is amazing the amount these diverticula can conceal before a bulging in the neck externally can be seen or detected.

Picture shows coin in the diverticulum.

My thanks are due to Lieutenant-Colonel Sir Bennett Hance, K.C.I.E., late I.M.S., for his assistance in obtaining the X-rays and information on this subject.

At Random

I

APOLOGY AND CORRECTION

A grave error was committed in the "At Random" in the April number of this JOURNAL.

A report was used under the title of "All in the Day's Work," of which the first part was stated to have been compiled by Colonel E. I. B. Harvey, *D.S.O.*, and it was stated that Colonel Harvey was A.D.M.S. 1st Airborne Division, and further that the authors' consents had been obtained for the publication.

Owing to a grave oversight, Colonel Harvey's consent to publication was never actually received.

Colonel Harvey states that he did not write this report nor was he A.D.M.S. of 1st Airborne Division, and categorically refutes any connection with these articles which were published without his consent.

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Will all Readers please note that the above mentioned report and articles were NOT compiled by Colonel E. I. B. Harvey and that he had no connection whatever with their publication or contents.

Apart from this mere matter of correction, we make most sincere apology to Colonel E. I. B. Harvey for the gross embarrassment and inconvenience which have been caused to him by the publication of these incorrect details and statements.

II

RECONNAISSANCE AND PUNCTUALITY

7 Field Ambulance was ordered under Brigade training exercise instructions to assemble at point X in a certain algad (ravine), to march up a certain track and to be ready for operation at point Y at 1250 hrs. Being new to the country and uncertain of the whereabouts of X and Y, the Commander thought that he would have a look round on his ride the preceding day and decide exactly where points X and Y were in a somewhat difficult piece of scenery.

For the Exercise next day everything went wrong from the start; the leading battalion failed to materialise at the appointed place and time, because they had assembled at a totally incorrect starting point; the enemy did not behave according to plan; Brigade H.Q. was sited wrongly at Point Y, for which the Brigade Major (now a Commander-in-Chief) received an irate telling-off; the enemy suddenly appeared from an unexpected direction, and at 1250 hrs. a nice battle was in progress at point Y.

7 Field Ambulance Commander, watching at Brigade H.Q. these goings on with anxiety and some amusement, was suddenly horrified to see emerging from Algad X up the track to point Y the unit of which he was Commander, led by his Second-in-Command in column of route into the midst of the battle. Hastily ordering a rapid return to the hiding place in the algad, the Commander awaited further events with trepidation.

The Exercise petered out with hot words to all units and a feeling of thankfulness for the cease fire.

Subsequently all officers assembled for the Brigade palaver and waited for the Brigadier's opening remarks with interest and apprehension. "Gentlemen," he said, "only one unit appears to have taken the trouble to verify its point of assembly and only one unit appeared at the correct place at the scheduled time and that was 7 Field Ambulance."

III

STAGING POST

Staging Post it is to be, after all; and not, as yet, *Journey's End.* A new team takes up the burden and a new vehicle is to be used to carry the JOURNAL on. The monthly numbers which have appeared throughout the years for very nearly

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fifty years must now cease and the JOURNAL must be restricted to a quarterly appearance. Not only so, but the generous space of some sixty to ninety pages per copy must be restricted severely in the initial issues to keep costs of production within the margin of income.

It is not lack of material but lack of means which necessitates this change. Even now there is in hand a full quiver of ammunition for the Editorial bow capable of providing a whole volley of monthly numbers. But the present costs of production of monthly numbers far exceed the attenuated and falling annual income.

The remedy and even the continuance of the attenuated production rests entirely in your hands. If every present subscriber produced even one other subscribing reader during the year, full production would again be possible.

It is, indeed, astonishing and distressing to find how many present and past members of our Army Medical Service do not support, and have not supported, the JOURNAL by their subscription.

For nearly fifty years the JOURNAL has produced and recorded the highest quality medical literature in articles varying from strategy to sanitation, from medicine to music and from ballistics to brains-trusts. Throughout the years the emphasis, natural in such a Service as ours, has been on Hygiene in its broadest sense and the attainment and preservation of health in the Service; but a glance back through its ninety-eight volumes will rapidly show the diversity of subjects covered and any reference to the Service journals of other nations will show the reputation achieved by those volumes. Now we come to a complete change.

It rests on you, the supporter of the JOURNAL, as to whether this is to be a short final stage or whether successful production can and will emerge from this *staging post*.

Correspondence

WALTER REED ARMY HOSPITAL,
ARMY MEDICAL CENTER,
WASHINGTON 12, D.C.
27th April, 1952

The Editor, Journal of the R.A.M.C.

DEAR SIR,

I feel that the article entitled "Requirements of a Military Hospital," by Major S. Mackenzie, requires comment insofar as the part relating to the X-ray Department is concerned.

It is not apparent what is meant by a "major" hospital, but it is taken to mean one which requires only one radiologist and whose department handles a

maximum of 20,000 cases per annum. Also it is presumed that all radiological work (excluding routine dental) is centralized in the department and that no other department is equipped with an X-ray set.

In planning an X-ray department is it essential to bear in mind not only current but also future requirements. In order to do this one has to be familiar with all current techniques and developments in equipment, whether at present used in the Army or not. Too often one visits an X-ray department and finds that the planner has failed to take these into consideration. Most civil hospitals are finding that, owing to a big increase in requests for radiographs, their departments are or will be too small.

My impressions of the suggested requirements are that they are altogether too small and awkwardly laid out. More detailed comments are as follows :

1. Perhaps the most satisfactory of the more modern layouts provides only one wide corridor, off which are located all the appropriate rooms, inter-connected as necessary by doors. This makes for easier supervision, better efficiency and saves space when compared with the multi-corridor layout.

2. Radiography rooms are required for each of the following :

Chest.

Abdominal radiography, including opaque medium intestinal radiography and urological radiography ; this room should be located next door to the screening room.

Special examinations: In this room such time-consuming examinations as bronchograms, encephalograms, angiocardiograms and others are or should be dealt with. Part of some of these examinations may well be dealt with by some other medical officer to enable the radiologist to be free to work elsewhere. Myelography can be carried out in the screening room.

Bones of all sorts.

3. The dark room measurements should be regarded as an absolute minimum. It is desirable to have one twice that size, especially in the tropics, and in any case it is often convenient to have the drying cabinet located there. Also in view of the recent development of the automatic processing unit, one end of which projects into the dark room, adequate room should be provided as this item of equipment may well become standard in large hospitals in the future. It is convenient to have a room next door in which film sorting is done and where films are arranged together with their envelopes and request forms. If an automatic processing unit is envisaged, it is convenient to house its other end in the film sorting room so that dried films can be removed from it. The dark room, too, should be located near the four radiography rooms and screening room, and be equipped with a light-proof hatch accessible from the corridor. In the suggested layout the drying room is most inconveniently located.

4. Some provision should be made for accommodating a stenographer. The ancient practice of writing out one's reports in longhand should in time give way

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to the more modern and time-saving method of dictating to a stenographer, as is the practice in civil hospitals and U.S. military hospitals.

5. A room should be provided for the personal use of radiographers, where they may keep their clothes and books and where they may read when not actually dealing with patients. In the event of female civilian radiographers being eventually employed in military hospitals at some future date, this room would be essential.

6. Some provision should also be made for an X-ray conference room, where medical officers can review current or library films on their own or in consultation with the radiologist. It should also house the film library and all teaching aids such as anatomical models, skeleton and charts.

Yours sincerely,
R. M. Hector,
Major, R.A.M.C.

Matters of Interest

NOTES FROM A.M.D.

BY OUR SPECIAL CORRESPONDENT

The most recent alterations to the Army List are as follows: To be Major-General, Brigadier F. K. Escritt; to be Brigadier, Colonel C. W. Greenway; to be Colonel, Lieut.-Colonel J. B. George—all with effect April 29th, 1952. To be Lieut.-Colonels: Major G. M. Curtois, April 18th, 1952; Major W. G. Macfie, April 29th, 1952.

EXTRACTS FROM GAZETTE

25.3.52 *R.A.M.C.*

Maj. R. Paul, M.B. (99690), retires with a gratuity, 24th March, 1952, and is granted the hon. rank of Lieut.-Col.

Maj. J. S. T. Goldie, M.B. (266540), is dismissed the Service by sentence of a Gen. Court Martial, 13th January, 1952.

1.4.52 Maj.-Gen. F. Harris, *C.B.*, *C.B.E.*, *M.C.*, M.B., Q.H.S. (15707), late R.A.M.C., to be temp. Lt.-Gen., 1st April, 1952.

Commands and Staff

Maj.-Gen. (temp. Lt.-Gen.) F. Harris, *C.B.*, *C.B.E.*, *M.C.*, M.B., Q.H.S. (15707), late R.A.M.C., from Dep. Dir.-Gen. Army Medical Services, War Office, 1st April, 1952.

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Col. E. H. Hall, *O.B.E.*, M.B. (36782), late R.A.M.C. is appointed Dep. Dir.-Gen. Army Medical Services, War Office, and is granted the temporary rank Maj.-Gen., 1st April, 1952.

R.A.D.C.
Lt.-Col. G. T. Drummond (45097) voluntarily retired on ret. pay, 29th Mar., 1952.

Maj. J. E. Maywhort (69257) to be Lt.-Col., 29th March, 1952.

8.4.52 *R.A.M.C.*
Maj. J. W. Spence, M.B. (102683), retires with a gratuity, 28th February, 1952, and is granted the hon. rank of Lt.-Col. (substituted for notifn. in *Gazette* (Supplement) dated 26th February, 1952).

Maj. (Qr.-Mr.) F. J. Campbell (123556) retires on ret. pay, 28th February, 1952 (substituted for notifn. in *Gazette* (Supplement) dated 22nd February, 1952).

G.O.C. 1st COMMONWEALTH DIVISION VISITS BRITISH COMMONWEALTH GENERAL HOSPITAL, KURE, JAPAN.

Senior officers of the hospital staff chat in the main porch. In the picture are: Colonel J. E. Snow, *O.B.E.*, late R.A.M.C., Commandant; Captain Doddridge, R.C.A.N.C., Deputy Matron (Canadian); Major J. C. B. Whycherley, R.A.M.C., Registrar; Major N. Boulley, R.A.A.N.C., Deputy Matron (Australian); Captain A. Frazer, R.C.A.M.C., Canadian Administrative Officer; and Lieutenant-Colonel P. Widger, R.R.C., Q.A.R.A.N.C., Matron.

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G.O.C. 1st COMMONWEALTH DIVISION VISITS BRITISH COMMONWEALTH GENERAL HOSPITAL, KURE, JAPAN.

Nursing Officers from three Commonwealth Nations work together in this hospital to help the sick and wounded from Japan and Korea. These officers are taking a stroll by the goldfish pond in the beautiful grounds of the hospital. From left to right these are: Captain Jane Guilfoyel, R.A.A.N.C., of Brisbane; Lieutenant Rachael Plante, R.C.A.N.C., of Quebec City; Captain Ann Rundle, Q.A.R.A.N.C.; Lieutenant Janice Moore, R.C.A.N.C., of Fredericton, New Brunswick; Lieutenant Elizabeth Welch, Q.A.R.A.N.C., of Flint, N. Wales; and Lieutenant Lou Bartlett, R.A.A.N.C., of Brisbane.

Obituary

LIEUT.-COLONEL JOHN HARE, O.B.E.

On 16th April, 1952. R.A.M.C., Retired. Second son of the late Samuel Hare, *O.B.E.*, J.P., of Howlish Hall, Bishop Auckland, he was born on 24th February, 1888. He took the M.B., Durham, in 1905 and the M.D. in 1929. He became F.R.F.P.S., Glasgow, in 1923 and D.L.O., England, in 1924.

He was appointed Lieutenant R.A.M.C., 26th July, 1912, from the 1st Northumbrian F.A., T.F., R.A.M.C., taking the Martin and the Marshall Webb Prizes. He retired 26th July, 1932, and was re-employed at the Victoria War Memorial Hospital, Hanwell, and the Q.A. Military Hospital, Millbank as Aural Surgeon.

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He served in France and Belgium, 5th September to 26th November, 1914; in Gallipoli, 25th April to 5th December, 1915; and in East Africa 21st June, 1916, to 15th November, 1917. He was twice mentioned.

J. G. F.

LIEUT.-COLONEL FREDERICK EMILIUS ROBERTS, D.S.O., O.B.E.

On 25th April, 1952, in West Worthing. R.A.M.C., Retired. Son of the late Dr. Charles Roberts, of Uxbridge, he was born 13th September, 1878. Educated at Malvern and St. George's Hospital, he qualified in 1904 and the D.P.H. in 1920. Appointed Lieutenant R.A.M.C., 31st January, 1905. He retired owing to ill health 18th January, 1930.

He served in France in 1914 and 1915 and with the Egyptian Expeditionary Force 1917—1919. He was three times mentioned in despatches, and was awarded the *D.S.O.* He again saw active service in Kurdistan in 1923, receiving the *O.B.E.*

J. G. F.

COLONEL HENRY WILLIAM GRATTAN, C.B.E., D.S.O.

On 30th April, 1952, in Hitchin. Late R.A.M.C. Retired. Son of Dr. M. H. Grattan, of Ongar, Essex, he was born there 11th April, 1872.

Educated at St. Laurence College, Ramsgate, and the London Hospital, he qualified in 1894 and took the D.P.H. in 1904. Commissioned Surgeon-Lieutenant, 29th July, 1895, he retired 26th December, 1921.

He was assistant to Sir William Leishman, with charge of the Army Anti-typhoid Vaccine Department, 1906 to 1910, and later had charge of the Enteric Depot and Bacteriological Laboratory, Northern Army, India, Honorary Surgeon to the Viceroy, 9th January, 1914, and was awarded the Kaisar-i-Hind Medal. After retiring he was M.O.H. to a number of Urban and Rural District Councils in Bedfordshire and Hertfordshire.

He served in South Africa in 1902, in France from 1914 till 1919. Three times mentioned in despatches, he was created C.B.E., and awarded the D.S.O.

J. G. F.

COLONEL EDWARD NORMAN PLATT MARTLAND, T.D.

On 2nd May, 1952. Late R.A.M.C., T.A., Retired. Born 12th July, 1894, he took the M.B., Manchester, in 1917.

Commissioned Lieutenant R.A.M.C.S.R., 9th July, 1917. He served in France from 1917 till taken prisoner in March, 1918. He was repatriated in December, 1918.

Between the wars he practised in Loddon, Norfolk, and was appointed Lieutenant-Colonel, R.A.M.C., T.A., commanding 163 (E. Anglian) F.A.T.A., which he raised, 1st December, 1937.

He was appointed A.D.M.S. with the rank of Colonel, 10th July, 1941, and appointed A.D.M.S., 10 A.A. Division, January, 1942. Subsequently he com-

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manded 10 General and Military Hospitals, Gibraltar. He received the T.D. in 1947, and re-signed 4th April, 1950.

J. G. F.

COLONEL DOUGLAS CRELLIN, M.C.

In Harrogate on 15th May, 1952. Late R.A.M.C., Retired. Born 4th March, 1890, he took the L.R.C.P. and M.R.C.S. in 1916 and joined the R.A.M.C. as a Temporary Lieutenant. He was appointed to a regular commission 1st June, 1920, and retired 1947.

Adjutant, 46 (N. Midland) Division, T.A., 28th October, 1926 to 27th October, 1929.

He served in France from June, 1916, till the end of the war, and was awarded the Military Cross for conspicuous gallantry and devotion to duty in remaining at an advanced dressing station till all the wounded were clear, in spite of the enemy's approach and the rain of gas and high explosive shell. He again saw active service in Iraq 1919-1920, in Palestine 1936-1937 and in the Middle East 1939 to 1944, being mentioned in despatches three times.

J. G. F.

COLONEL DAVID AHERN, D.S.O.

Suddenly in Cheltenham on 15th May. Son of the late T. M. Ahern, J.P., of Maryborough, Glanmire, Co. Cork, he was born 2nd January, 1878. He was educated at Clongowes and Edinburgh, and he joined the Corps in January, 1903, and retired 2nd January, 1935.

He was A.D.M.S. India from 1931 to 1933 and D.D.M.S India, 1933 to 1934 ; appointed Honorary Surgeon to the Viceroy of India, 1932. He rejoined on 30th August, 1939, and was employed on Medical Boards.

Twice wounded and twice mentioned in despatches, he was awarded the D.S.O. and Bar—the Bar for conspicuous gallantry and devotion to duty from 30th August to 3rd September, 1918, during operations on the Arras front.

J. G. F.

Notices

FIFTH INDIAN DIVISION

The Seventh Annual Dinner of the Officers' Dinner Club will be held on Friday, 3rd October, 1952, at Simpson's in the Strand, London, W.C.2.

The Chairman will be General Sir Mosley Mayne, *G.C.B.*, *C.B.E.*, *D.S.O.*

Dress : Dinner jacket, uniform, or lounge suit. Tickets 16s. 6d. (members) and 21s. 6d. (non-members). Further details and particulars of membership from Hon. Secretary, 5th Indian Division Officers' Dinner Club, c/o Messrs. Glyn, Mills & Co. (Holts Branch), 22 Whitehall, London, S.W.1.

SWORDS AND FROGS AND SAM BROWNE BELTS

The Commandant, The Depot & T.E., R.A.M.C., keeps a small pool of swords, frogs and Sam Browne belts, which officers may borrow for ceremonial parades.

Donations of swords, frogs and Sam Browne belts to the Commandant, The Depot & T.E., R.A.M.C., would be very much appreciated.

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Book Reviews

A SYNOPSIS OF OPHTHALMOLOGY by J. L. C. Martin-Doyle. John Wright & Sons Ltd. Published at 20s.

The writing of synopses is a difficult art and few authors will be able to please all tastes. This book, into which a vast amount of information has been compressed, reads more like an abbreviated textbook, but can hardly be said to fulfil the claims made for it.

The senior student starting ophthalmology will soon find himself in deep water, with little help from Chapter I (on routine examination), while the post-graduate revising for a diploma will probably prefer his own notes.

Apart from short definitions of operations, surgery has wisely not been dealt with. A useful table of syndromes is included, but it is surprising that toxoplasmosis is not mentioned in a book that claims to be comprehensive.

J. B. G.

A SYNOPSIS OF HYGIENE (Jamieson and Parkinson). 10th Edition by Llywelyn Roberts, M.D., M.R.C.P., D.P.H., with the assistance of Kathleen Shaw, M.B.E. J. & A. Churchill Ltd., 1952. Pp. 891. 42s.

This edition includes much new material while retaining the general characteristics with which many readers will have been acquainted in previous editions. References are extensive and up to date. In the section headed Prevention and Control of Diseases there is a vast amount of practical information, from venereal disease prophylaxis to disinfection of sandpits in public parks and nursery schools. There is much about the rat in relation to plague, but no reference could be found to immediate action against the flea, using modern insecticides. In some cases, e.g., poliomyelitis, rearrangement of the material might leave the student with a clearer conception of practical counter-measures. Sections on food, water and disposal of wastes are all helpful. Additions to the vast array of "Public Health Law" might well be noted by the student on a few blank pages were these included. The index was found to be adequate.

Dr. Llywelyn Roberts is to be congratulated on his selection of material and on maintaining the claim that this volume has become the vade-mecum of Ms.O.H. and a standard textbook for D.P.H. students.

"Jamieson and Parkinson" should continue to be a standby for Army Health specialists and trainees. The new edition fully justifies its inclusion in military medical libraries as a work of reference. In welcoming a new edition of this book it may also be fitting to salute the names so long associated with it and with the work and life of the Corps.

A. E. C.

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EDITORIAL NOTICES

The Editor will be glad to receive original communications upon professional subjects, travel, personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a *nom de plume*.

All Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the author notifies at the time of submission that he reserves the copyright of the article to himself) become the property of the Library Committee who will exercise full copyright powers concerning such Articles.

A free issue of twelve reprints will be made to contributors of all main articles.

Reprints or excerpts, additional to the above, can be furnished on payment if specially ordered at the time of submission of the article for publication.

Communications in regard to editorial business should be addressed—"The Editor, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

MANAGER'S NOTICES

The Annual Subscription for the Journal of the Royal Army Medical Corps is £1 10s., payable in advance. Single copies, 3s. 6d. per copy.

Cheques, etc., should be made payable to the "Journal R.A.M.C.," and crossed "Glyn, Mills & Co."

Communications in regard to subscriptions, change of address, etc., should be addressed "The Manager, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

The attention of subscribers is drawn to the Manager's notice on page 205 of the March issue.

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Communications regarding advertisements should be addressed—

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EDITOR:

LIEUTENANT-COLONEL J. B. NEAL, *T.D.*, R.A.M.C.

MANAGER:

MAJOR F. LISTER HOLROYD, R.A.M.C.

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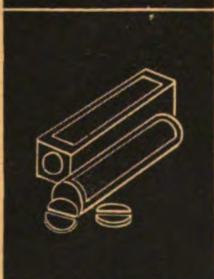

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Vol. 98, No. 6, was issued on 8th August, 1952

Authors are alone responsible for the statements made and the opinions expressed in their papers.

Journal
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Royal Army Medical Corps

Original Communications

A LITTLE SURPRISE PACKET

BY

Major G. P. CREAN, M.R.C.S., L.R.C.P.
Royal Army Medical Corps

As an introduction I ask of my reader only two things :

1. Preserve an open mind no matter the degree of provocation.
2. Summon the energy to read to the end.

The subject of this article is

"*CINDERELLA*" (*yes*, "*Cinderella*")

"Once upon a time there lived in the same house two sisters, the elder called Fanny, the younger Cinderella. Fanny was quite an attractive girl, a little past her prime perhaps, inclined to be extravagant, not very adaptable, and rather dependent on others. She was, moreover, a little on the large side and her dresses often did not fit, although by 'cutting a bit off here and adding a bit on there' she always managed to keep up appearances, particularly with the help of Cinderella. Cinderella, on the other hand, was just the right size and shape, and was, in addition, very adaptable indeed. It was she who did nearly all the difficult jobs in the house, but due to her being always employed in some menial capacity when visitors came, it was never realized that it was her efforts which really made the household function so smoothly. Indeed at times of crisis, she it was who did all the work, although she was so modest no one noticed it.

"Now there lived in the same kingdom a Prince who for various reasons was 'wife hunting.' The familiar story of how he found his bride need not be repeated. Sufficient to say that he was a difficult man to please, but knew a good

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thing when he saw it. He married Cinderella, we married Fanny. Cinderella's other name was Miss Field Dressing Station and Fanny's other name was—yes, Miss Field Ambulance."

By now you have probably got what I am driving at. Simply put it is as follows :

In my opinion, and I hope to substantiate it to your satisfaction with facts, the Field Ambulance, at least in its present form, is extravagant of men and material, and all its functions can be carried out more efficiently by the Field Dressing Station, with half the men and half the material.

This statement would seem, at first sight, extremely rash, until one analytically examines the known facts. We have always been led to assume that the Field Ambulance is adaptable, but is it in actual fact ? We have indeed employed it in many roles, but I submit that any unit of comparable size with the same equipment could have done as well, and I propose to try to convince you that a Field Dressing Station can do much better.*

Consider first the Field Ambulance as a whole. It is a large unit of 13 officers, 221 other ranks, 54 vehicles (excluding bicycles) and 6 trailers. It consists of a Headquarters, which provides the A.D.S., and a company, whose main function is the evacuation of casualties from the unit R.A.P. to the A.D.S.

The company holds 5 officers (1 non-medical), 91 other ranks, 23 vehicles (excluding bicycles) and 3 trailers. It is designed to be divided if necessary into three sections (each of which can form a C.C.P.) and a Headquarters, all four being able to operate independently. It has no wireless, and without going into fuller details of its employment, which can be found very adequately covered in Pamphlet No. 2, it can be stated that the deployment of all three sections is not encouraged, except under exceptional circumstances. Indeed, during the last war and even more recently in Korea, the company has tended to function as a unit forming what was formerly known as an A.D.S. This has been done because of the difficulty of control of scattered C.C.Ps., by the Company Commander (often to be found "like Rachel bewailing her lost children") and also for greater efficiency, with duties and personnel as far as possible on a "roster" basis, and with a "tactical reserve" always at hand. Whether one is prepared to argue one way or another, the fact remains that 4 medical officers, 1 non-medical officer, 91 other ranks, 13 load-carrying vehicles and 3 trailers (excluding ambulances and motor-cycles) are employed in the *sole* duty of evacuation of casualties. A great economy could therefore be effected if the company could be dispensed

* With the exception of airborne and amphibious operations and, of course, Arctic and Atomic Warfare, I have been fortunate enough during the war to have had experience with a Field Ambulance (and, for a short time, a Field Dressing Station) in the Desert, in Italy or in North-West Europe in all the roles discussed. As a Regimental Medical Officer with armoured and infantry units I had also the opportunity of studying the medical set-up from the "sharp end," but I do not pretend that my knowledge, although comprehensive, is by any means complete. For that reason I shall frequently refer you to the R.A.M.C. Training Pamphlet No. 2, the best authoritative work on the present field organization of the R.A.M.C. It is largely due to the analysis of the material therein, coupled with my own experience, that I have come to my present conclusions, and I maintain that although I may have gone into schism I have not broken away into heresy ! I must, however, exonerate the authors of the pamphlet from all responsibility for any statements I may make or conclusions I may draw.

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with altogether, and the evacuation of casualties from R.A.P. carried out by other and more economical methods.

Very recently the whole problem of the load-carrying vehicles in the section has come under review, and attempts have been made to reduce the number of "prime movers" by substituting 2-ton trailers. As was well brought out on medical exercise "Mushroom," this is completely unsatisfactory, and as a result the problem would seem at present almost insoluble. Each section must carry a minimum of equipment to render it capable of action in an independent role, and this equipment must be carried in vehicles, which, it is almost certain, will *not* be available. One solution suggested, that of a radical reduction in equipment, will not only destroy the working efficiency of the section, but will virtually reduce the C.C.P. to a rather elaborate car post, in which case the question may very well be asked, "Why waste a medical officer with such a unit, and why carry around so much equipment ?" Pursuing this line of reasoning, one may logically ask whether a C.C.P. or section (whichever way it may be considered) is a necessity. I propose to demonstrate that it is not.

On various occasions in the past it has been suggested that medical personnel should be posted to units as stretcher-bearers, and it should be remembered that there are now, for example, 1 sergeant and 4 corporals R.A.M.C. on the Higher Establishment of an infantry battalion, but the stretcher-bearers of a combatant unit will always remain a problem both as regards quantity and quality. If, however, we post sufficient R.A.M.C. personnel to the unit (and this is, in general, well favoured by combatant officers), the advantages of such a system are as follows :

1. The R.M.O. has a trained and adequate body of men, of his own Corps, always at hand for all medical duties in the unit, including, if necessary, the carriage of medical equipment when other means of transport cannot be used.

2. The Officer Commanding has no longer the worry of finding stretcher-bearers from combatant personnel, nor the R.M.O. the heart-breaking job of trying to train them. There are, moreover, large numbers of R.A.M.C. personnel incapable of ever becoming satisfactory nursing orderlies who would make excellent stretcher-bearers.

3. The addition of these extra personnel entails no increase in the administrative load of the unit, very little, if any, increase in transport, and, what is more, the skeleton framework already exists in the form of the 5 N.C.Os., R.A.M.C., referred to above.

4. The incorporation of medical personnel in a unit results in higher morale and efficiency both of the unit and the personnel attached. Our American cousins will vouch for that.

5. The C.C.P. is rendered unnecessary since all its functions can now be carried out by the unit R.A.M.C. personnel. Pamphlet No. 2 is quite clear on this point when it states that "if it is possible to evacuate direct from R.A.P. to A.D.S. the establishment of a C.C.P. is unnecessary and should be avoided."

If then the C.C.Ps. are rendered unnecessary by such an arrangement, the *raison d'etre* of the company has vanished.

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Now to come to the A.D.S. The first point that should be noted is that, with the company deployed, only 2, or if we include the H.Q. Section, 3 medical officers out of the total of 8 in the Field Ambulance are available for the treatment of casualties. This is, I submit, an inefficient employment of valuable medical manpower. This point has long been appreciated and it is; therefore, recommended that a Field Ambulance should function whenever possible as one medical unit. This is a tacit admission that the present layout is an expedient forced upon us by the exigencies of the situation, and the extreme modifications introduced as a result of the Hood Committee Report bear this out.

The second point which may be considered is Equipment. It is stated that the A.D.S. can hold and treat 150 casualties. With present tentage and equipment, I should say that this is an extremely optimistic figure. It must be remembered that a very sizeable proportion of medical equipment is with the company, and in actual fact the Field Dressing Station carries far more medical equipment than an A.D.S. and is far better equipped all round.

The third point is the question of Tactical Employment. The A.D.S. is a large and unwieldy unit which cannot be split. The best it can do is to detach its H.Q. Section, which in itself is no better equipped to treat cases than are the sections of the company. Moreover in treatment personnel the Field Dressing Station is actually far better off, and in addition can be split, if so desired, into two identical sections. This point will be further considered later.

It might here conceivably be argued that the Field Ambulance has already proved its worth. The facts, however, show that if the Field Ambulance is required to function under special or unusual conditions, where a formation may have to rely entirely on its own medical resources, an Advanced Surgical Centre is invariably attached. This is nothing more than a Field Dressing Station with a surgical component. It happens, therefore, that when such an operation is completely successful from the medical standpoint, much of the credit for the work, in reality done by a Field Dressing Station, goes to the Field Ambulance.

So far nothing has been said about the function of the Field Ambulance in special roles—e.g., airborne and amphibious operations. I admit that I have no personal experience of the medical side of either, and therefore I must refer my readers to the excellent résumé contained in Pamphlet No. 2 under "Airborne Operations and Assault Landings."

First let us take the *Airborne Field Ambulance.* All the disadvantages of weight and size apply to an even greater degree here, and in reality the company *per se* has been dispensed with, the sections being attached to and coming under command of battalions. In addition, the other objections raised above apply to a still greater extent in a situation where there may well be large numbers of casualties in a restricted area, and where it is essential, at least in the initial stages, to concentrate more on treatment than on evacuation. It is unnecessary to discuss this matter in further detail, but the significance of the comparative weights of equipment carried by a Field Ambulance and a Field Dressing Station will, I think, strike my airborne readers especially forcibly.

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	Field Ambulance	Field Dressing Station
Medical equipment dead weight (tons)	1½	1*
G1098 equipment dead weight (tons)	10	4*
Total (tons)	11½	5

Amphibious Operations

These also will not be considered in detail. The accepted layout shows that a Beach Medical Unit as well as an Advanced Surgical Centre is required to help the Field Ambulance, whose vehicles provide an even greater problem in transportation than those of the Airborne Field Ambulance whose "tail" rejoins it later by road. In contrast, comparison of the vehicle figures of the Field Ambulance and the Field Dressing Station demonstrates even more forcibly the advantages possessed by the latter.

	Field Ambulance	Field Dressing Station
Vehicles (excluding ambulances)	38 vehicles and 6 trailers	21 vehicles and 2 trailers†
G1098 and I1248 tonnage	39½	16¾

Atomic warfare, aid to the civilian population after heavy air attack, etc., have not up to now been discussed, and these problems will be considered in relation to the Field Dressing Station in its new role, but I suggest that I have already submitted enough material justifiably to summarize my conclusions as follows:

1. The Field Ambulance is not as adaptable as is generally supposed, and owing to its size presents a very big problem in very mobile airborne or amphibious operations.
2. It is extravagant of vehicles, personnel and, in consequence, equipment.
3. The A.D.S. is not an efficient treatment unit and almost invariably needs the help of a Field Dressing Station or other medical unit, when acting in a special role.
4. The company of the Field Ambulance is an unnecessary waste of valuable personnel and material when its function can be carried out more efficiently and more economically by attaching sufficient R.A.M.C. personnel to units.‡

Before considering the Field Dressing Station in its proposed new role, it might first be as well to clarify certain points.

(i) It is taken that the layout forward of the Field Dressing Station is as

* Note the very high weight ratio between the I1248 and G1098.

† Note that up to the present no attempt has been made to reduce still further the number of vehicles in a Field Dressing Station (see para. (ii) below).

‡ There is at present no special qualification of "stretcher-bearer" in the R.A.M.C. except in respect of non-medical officers. Many G.D.Os. in wartime, and even in peace, found eking out a "bloody-minded" existence in a hospital, a base or even field unit, could be transformed by a medical training well within their mental limits and a job of which they could be justly very proud, the flash "Stretcher-Bearer" on their shoulders giving them a sense of superiority instead of one of inferiority among their, perhaps mentally better equipped, comrades.

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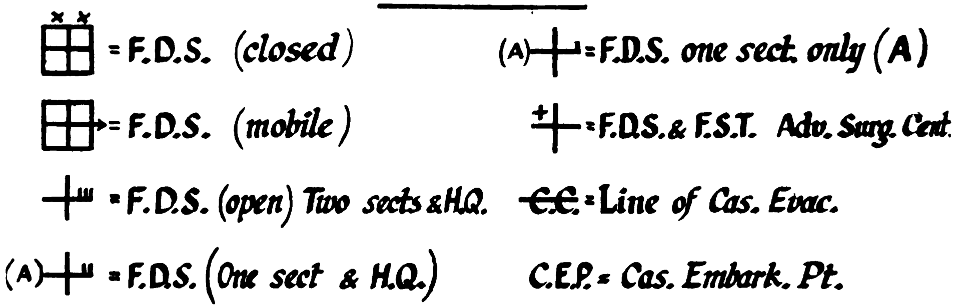
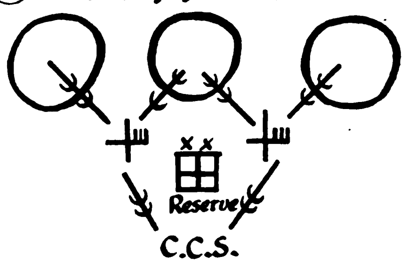
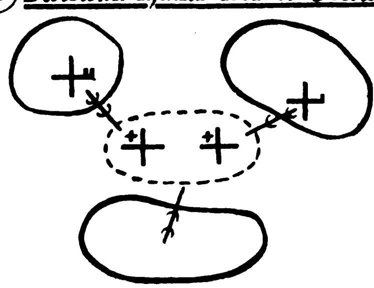
PROPOSED TACTICAL EMPLOYMENT OF F.D.S.
(DIAGRAMMATIC)



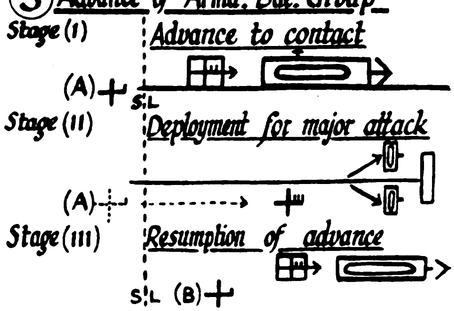
1 *Division deployed in line*



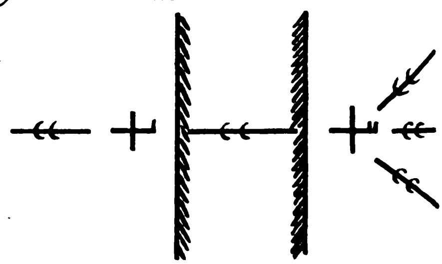
2 *Divisional defended area or "Bastion"*



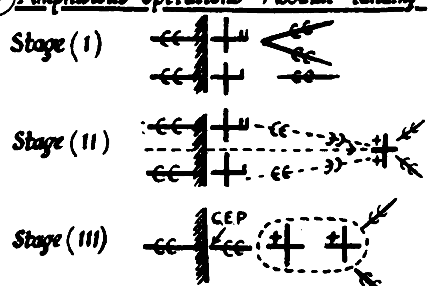
3 *Advance of Armd. Bde. Group*



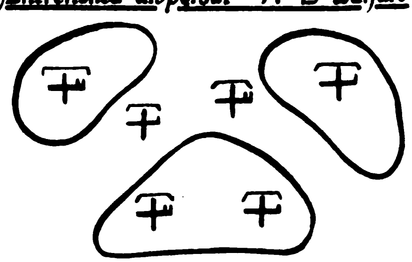
4 *Wide river barrier or water obstacle*



5 *Amphibious operations Assault landing*



6 *Entrenched dispersal A-B warfare*



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visualized above, i.e., R.A.M.C. personnel attached to units ; although, in any case, it is not conceded that the F.D.S. could not work in the absence of this arrangement. Medical personnel could, if necessary, be detached from the F.D.S., but such a practice is to be condemned except under most exceptional circumstances and in grave emergency. It is, however, once more brought to your notice that the F.D.S. can be divided into identical sections, should such deployment become necessary. This is to be avoided whenever possible, but in certain cases, which will be dealt with in detail below, such an arrangement is both possible and even desirable.

(ii) I have taken the F.D.S. as it actually stands both as regards personnel and material. So far the Field Dressing Station has never been considered as a possible substitute for the Advanced Dressing Station. The process of modification need be only minimal, but should it be necessary, it is easy to reduce still further the number of vehicles, e.g., one of the water trucks at least can be replaced by a water trailer. However, as my reader will appreciate, it would be a waste of time to get involved in a mass of details at this early stage. This work is very much one for a committee of specialists of the various branches involved.

Now consider the F.D.S. in the new role. Even at present it is probably the most adaptable unit in the army, and can be used—

(*a*) for the treatment of minor sick or special cases (psychiatric, venereal, etc.) in the Division or Corps ;
(*b*) as a filter to a Casualty Clearing Station ;
(*c*) as an Advanced Surgical Centre ;
(*d*) as an Air Evacuation Unit, etc.

"The sections may operate together, separately or be used for 'leap-frogging.' . . . In special circumstances the F.D.S. may be employed in the divisional evacuation plan." (Pamphlet No. 2, paras. 156 and 157.)

Let us now go one step further and see whether the F.D.S. cannot function in the place of the Field Ambulance.

1. The Field Dressing Station is a unit of 7 officers (5 medical officers, 1 non-medical officer and 1 quartermaster), 115 other ranks, 21 vehicles and 2 trailers. It carries a very good "layout" of canvas, which is best appreciated by reference to the Pamphlet, Appendix 3*b*. I think it will be agreed that the Advanced Dressing Station (Appendix 3*a*) comes off a very poor second !

2. It is designed to hold 100 patients, 40 on beds and 60 on stretchers, and is fully equipped to treat them.

3. All the medical officers are, if necessary, available for treating cases (the non-medical officer being available for administration, which is of course much less than in a Field Ambulance.) By addition of a surgical team we have a field hospital more compact, more mobile, and in every way more suitable than the A.D.S., and we can if necessary divide the F.D.S. into two identical sections, each of which can form a small field dressing station.

4. In buildings the superiority of the F.D.S. with its much smaller administrative and much larger medical element (5 medical officers and 28 nursing order-

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lies as opposed to the 2 available M.Os. and 13 nursing orderlies of a Field Ambulance A.D.S.) is even more clearly demonstrated.

If we now give the F.D.S. 8 ambulance cars (the same number as the A.D.S.), the over-all saving by the replacement of the three Field Ambulances in a Division by three Field Dressing Stations is as follows: 18 officers, 318 other ranks, 62 vehicles, including 24 ambulance cars, and 17½ tons of equipment on present establishment. (Dental officers are included in the above total, but their attachment to a Field Ambulance is a debatable point. In any case the addition of a Dental Unit to the F.D.S. provides no special problem.)

Administration (*General*).—From the administrative point of view these small self-contained standardized units very nearly approach the ideal, but the Commanding Officer of such a unit, in view of its multiple potential roles, would still have to be a lieutenant-colonel. It most certainly would not be the job for a junior major.

Employment in Army and Base Areas

One F.D.S. is capable of running at least two 100-bed Medical Reception Stations, providing the "medical cover" for a Convalescent Depot, or a series of Medical Centres, though the medical equipment in the latter case *might* have to be slightly supplemented. The centralized medical and administrative organization would, however, still be there, thus saving the A.D.M.S. from the unnecessary, petty, but often infuriating difficulties always associated with small isolated medical installations of this type, besides providing him with a unit for a local emergency.

Employment in the Division

The Tactical Role.—It is proposed that the three Field Ambulances of the Infantry Division be replaced by three F.D.Ss. The A.D.M.S. then has three identical units which he can use in any way he pleases. He can attach them to brigades, replace and rest any of the units, use any of them as Advanced Surgical Centres with the simple addition of a Field Surgical Team, or maintain a mobile reserve of one or even two F.D.Ss., if he so desires (Diagram 1). The control of these units is infinitely easier than that of Field Ambulances even should they not be in wireless communication, and the fact that each brigade or division has a limited number of medical units does away with all the difficulties of the deployment of Casualty Collecting Posts, small units without wireless and only in contact by D.R. In addition the problem of the supply of medical equipment, rations, P.O.L., etc., are much simplified by having only one unit instead of the minimum of two (and sometimes five when the company of a Field Ambulance is fully deployed).

In Defence.—In "Divisional Defended Areas," with the addition only of the two Field Surgical Teams normally allocated, the A.D.M.S. would have a compact and complete medical "set-up" which he could not have had before. With the two F.S.Ts. attached, two F.D.Ss. have the treatment and holding capacity of a Casualty Clearing Station, while the third could be held as a

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reserve, used as a casualty evacuation unit to the other two, or even supply two smaller evacuation units by being divided into sections (Diagram 2).

The Armoured Division.—This can be equipped with two F.D.Ss. instead of two Field Ambulances, making, with the Divisional F.D.S. normally allotted, three in all. Their mobility and small size make these medical units a great asset (as opposed to a "necessary evil"), able to deal with the difficult and unexpected situations often met with in this type of warfare. For example, by dividing one F.D.S. into its sections, one deployed at the start-line and one travelling with the column, and by "leap-frogging" the sections, a Mobile Brigade Group could have continuous and efficient "medical cover," no matter how fast the advance (Diagram 3). That is not possible with the present Field Ambulance with its sections deployed, Company H.Q. in one place, Field Ambulance H.Q. in another, and the practice of attaching companies to brigades while retaining the A.D.S. under divisional command is an invidious compromise which can and does lead to all sorts of complications.

In Retreat.—The F.D.S. can again be divided, leaving only one section to accompany the rear brigade or "fighting echelon," the other being drawn back in advance of the main body. For such an operation one section would be adequate "medical cover," and of far more use than one section or even the whole company of a Field Ambulance.

Airborne Operations

The "flying-in" of all medical personnel and a substantial portion of medical and ordnance equipment is quite possible, leaving only a minimum in the "ground-tail." The high percentage of medical personnel, the smaller total numbers and the great saving of weight as compared with a Field Ambulance, would make the F.D.S. a far more attractive proposition to "G" as well as "Medical," but to make a full comparison between it and the Field Ambulance in an airborne role would require a complete article written by one who had actual experience in this type of operation. I, therefore, must ask my airborne reader to examine the whole picture himself and draw his own conclusions, which could be interestingly summarized as answers to the following questions :

1. Is the present Field Ambulance completely satisfactory in an airborne role. If not, what modifications do you propose after consideration of the objections already raised against it in a ground role ?

2. Do you think that the solution suggested, i.e., attachment to a unit of R.A.M.C. personnel in sufficient number and
   (*a*) the substitution of a F.D.S. for an Advanced Dressing Station a satisfactory one ; or
   (*b*) do you think a modified form of F.D.S. would be better, taking into account the question of standardization, a factor of great importance both for Medical and A/Q generally.

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Amphibious Operations

Assault Landings (*Diagram* 5).—There would seem no reason why one F.D.S. should not provide the Beach Medical Unit. In the form of an Advanced Surgical Centre, it is the first real *treatment unit* ashore, and a second would provide far better "medical cover" than the A.D.S. of a Field Ambulance. As has already been pointed out, the addition of two Field Surgical Teams virtually produces the equivalent of a Casualty Clearing Station, and one which possesses, moreover, the invaluable quality of being fully mobile, which the C.C.S. most certainly does not.

River Crossings (*Diagram* 4).—The Field Dressing Station, in the case of a large river barrier, can be divided into its two sections, each of which has a substantial holding capacity in the event of a "hold-up" in the evacuation arrangements.

War in Undeveloped Countries

Long Lines of Evacuation.—In the event of war in primitive countries, long lines of evacuation by road may be the rule. Without going into details it can be seen that by dividing the F.D.S. into its sections (in case of shortage) and allowing a two-hour journey by ambulance car, i.e., 30-50 miles, a 50-patient convoy can be looked after for 60-100 miles by one F.D.S. with adequate facilities for rest under proper medical supervision.

Arctic Warfare

This is a type of warfare which demands the smallest type of unit compatible with efficiency, and problems of transport assume a major importance.

Although casualties are usually few, the frequent and virulent weather changes demand that the medical unit be fully equipped to hold its casualties, if necessary, for days on end. The F.D.S. would seem to fulfil these requirements adequately, although naturally Arctic equipment would be used.

Atomic Warfare

In the Field.—Although fortunately as yet we have had no practical experience of an atomic attack, we take it that here all medical units are of value as *treatment* units only. The F.D.S. with its relatively larger number of medical personnel, its compactness and its better equipment, must obviously be superior to a Field Ambulance. Moreover, in the likelihood of atomic attack, an A.D.M.S. can disperse all three F.D.Ss. into six units *without* very seriously affecting his medical "set-up," and if, as would appear likely, certain of these will themselves become casualties, he has the maximum number of identical reserves. (Diagram 6.)

Aid to Civil Authorities.—The compactness of the F.D.S. and its capability of being divided into two sections (open and closed alternately) would enable it to carry on more efficiently and for a longer period than a unit which does not possess this facility. Due to its size, moreover, more than one F.D.S. can fit into a small area. An A.D.M.S. Division, if he so wishes, has up to six treatment units to cope with an "incident," or he could, for example, supply three F.D.Ss. to staff adequately a hospital of at least 600 beds.

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Incorporation in the European Defence System

This is one further point of importance to consider. Such a formation can easily be integrated into the Land Forces of any of the North Atlantic Treaty Powers, whether the unit of these forces is the Regiment, the Brigade Group, the Division or any other sub-formation, and this is of great importance when we realize that the successful defence of Europe depends to a very great extent upon uniformity of structure and function in the forces taking part. It can no longer be considered as being simply a problem of either "Static Defence" or "Defence in Depth" with local counter-attacks, and it is highly unlikely that our future foes will be so obliging as to present an ideal target for the atom-bomb with heavy concentrations in restricted areas prior to the launching of the initial assault. Rather with the picture of 1940 in mind (and it should be remembered that there are many former German officers employed on the Staff of the prospective enemy), it is to be expected that he will rely on extremely rapid and very deep armoured thrusts against which the atom-bomb will be useless unless we are content to make a holocaust of our own troops and turn the whole of Western Germany into a charnel-house. Even assuming that tactical atomic weapons are perfected, they will still be very difficult to use once our positions have been penetrated in depth, more especially if the enemy should use any atomic weapons he may have at his disposal against a "Defended area" or "Bastion" formed in the case of envelopment. We must, therefore, visualize a defence based upon immediate and violent reactive armoured penetrations of the enemy front and its complete disintegration from the rear in depth, not of ten or twenty miles but perhaps up to 500 miles or more. "Held by the throat in the West, the Bear will be torn open on the plains of Eastern Germany, Poland and even the Ukraine." These attacks will most probably be carried out by armoured formations of not more than regimental (two-battalion) strength, sufficiently small and mobile never to offer a satisfactory target for an atomic attack and yet sufficiently powerful to destroy the communications and base installations of an Army Group ; and, if necessary, capable of tackling and destroying individual enemy armoured elements protecting convoys of "soft" vehicles. For such an operation the escorting medical cover must be as efficient and as small as possible, and the F.D.S. itself might have to be further "streamlined" or subdivided into sections.

Some of my readers may consider the above somewhat speculative, so I will end on a note perhaps more practical and certainly very topical.

Up to now I have said nothing about the Territorial Army, which, after all, provides nearly all the Field Ambulances. One cannot pretend that the formation or "maintenance in being" of a Territorial Field Ambulance is at present an easy task. Besides the difficulty of recruitment there is always the difficulty of the administration of a large unit without a Regular officer which falls on the shoulders of already overworked doctors, who, in spite of being about the hardest workers in the community, are still the most conscientious and consistent officers in the Territorial Army. It could, therefore, be a great advantage if the Field Ambulance were much reduced in size, and still retain its traditional

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entity, which can be done very simply by renaming these Field Dressing Stations "Field Ambulances," for they would perform the same functions and the term "Field Dressing Station" is, in any case, a misnomer. If we can, moreover, produce very nearly two Field Ambulances in the place of one, the conclusion, I submit, is obvious.

Finally, I should like to ask a question : We have employed "Cinderella" at one time or another for every job in the household. Are we quite certain she cannot run the whole house ?

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

IV.—THE TREATMENT OF CHRONIC URINARY CARRIERS

BY

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and

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THE treatment of chronic enteric carriers is an important problem. Though numerous authors have reported the results of treating fæcal enteric carriers and coliform infections of the urinary tract, accounts of the treatment of urinary enteric carriers are scanty. This may be because urinary carriers are, in general, less frequent than fæcal carriers and show less tendency to become chronic. Vogelsang and Boe (1948) report that urinary enteric carriers can, in most cases, be successfully treated by urinary disinfectants. Anderson and Richards (1948) treated an Egyptian urinary carrier of *Salm. typhi* with sulphadiazine ; organisms were absent from the urine during treatment but returned within twenty-four hours of withholding the drug. Moore and Rumball (1950) report the cure of urinary, but not fæcal, excretion by a carrier of *Salm. kottbus* following a course of 25 g. of chloramphenicol. Kennedy and Millar (1951) describe the successful treatment of a urinary carrier of *Salm. paratyphi B* with chloramphenicol;

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sulphadiazine, penicillin and streptomycin were tried without success. Miller (1952) found that ten of fifteen Egyptian urinary carriers treated with chloramphenicol were still culture-negative after two and a half to three and a half months.

In Egypt carrier incidence is unusual in that urinary carriage appears to be more frequent than fæcal and chronicity is common. The incidence of chronic carriage amongst Egyptians and conditions associated with it are described in the second paper in this series (Archer *et al.*, 1952), where it is suggested that concurrent schistosomiasis is largely responsible for chronicity, perhaps by providing foci for bacterial invasion. Miller (1951) found radiological evidence of calcification of the bladder in a number of chronic urinary enteric carriers with schistosomiasis. Calcification of this nature is commonly preceded by fibrosis, and urinary stasis due to reduced contractility of an organ so affected may play a part in prolonging the carrier state.

The high incidence of chronic urinary carriage among Egyptians shows the need for its successful treatment. Moreover, the results of treatment may give some information on the pathogenesis of chronic urinary carriage associated with schistosomiasis. In individual cases results may be difficult to interpret because of unknown factors which are simultaneously involved. These may include the following: urinary stasis due to fibrosis of the bladder, which will probably be unaffected by treatment; lesions of the bladder wall due to extrusion of ova, which may continue for some time after the death of the worms; and depth of infection of the bladder wall. In spite of these sources of difficulty, cure by urinary antiseptics alone would suggest that stasis of urine rather than infection of the bladder wall is the chief factor in the prolongation of the carrier state; whereas cure by anthelmintic drugs alone would suggest that bacterial invasion of lesions caused by extrusion of ova is the chief factor. There are obviously other possibilities.

Present Investigation

Three chronic urinary carriers have been treated. In view of the reputed ease of curing simple urinary carriage, treatment with hexamine (now removed from the B.P. in view of its relative inefficiency when compared with modern chemotherapeutic agents) was first tried. When this failed, other drugs were used. Failure of all anti-bacterial agents was to be followed by treatment of the patient's schistosomiasis. This, if not in itself effective in curing the concurrent carrier state, was to be followed by a repetition of the drugs earlier employed. Radiographical examination of the bladder for evidence of calcification in any of these cases was also proposed, but this could not be carried out as the patients left the Canal Zone with the majority of Egyptian employees following the abrogation by Egypt of the Anglo-Egyptian Treaty. The apparent success of anti-bacterial treatment in two of the three cases available meant that further carriers must be obtained before the effect of anti-helminthic treatment could be assessed. This, and the more prolonged follow-up of the apparent cures, also became impossible owing to the disappearance of the patients and other Egyptians.

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Cases

The chronic urinary carriers were discovered during the routine examination of Egyptians who sought employment as foodhandlers. A number of these carriers were employed as labourers and visited the laboratory daily to pass a specimen of urine. These carriers were under regular surveillance for months. The cases treated were carriers 9, 10 and 20 described in the second paper of this series. The features of these cases are shown in Table I.

TABLE I.—HISTORY OF URINARY CARRIERS BEFORE TREATMENT

Patient	Organism Carried	Known Period of Carriage	Previous Treatment for Schistosomiasis	Schistosomiasis	Cellular Content of Urine	Presence of Urinary Antibodies
Case 9	*Salm. paratyphi A*	14 months	None	Viable ova observed at 116 of 170 examinations	RBC and WBC present daily	H antibodies to *Salm. paratyphi A* consistently present to a titre of 1/8 or 1/16
Case 10	*Salm. typhi*	8 months	Yes, by his own doctor. Details not known.	Urine contained Schistosoma ova consistently until 26/6/50. Then treated. Occasional ova, some degenerate, until December, 1950. During 1951 no ova observed at 160 examinations and no miracidia observed after attempts to hatch ova.	RBC and WBC present daily	H antibodies to *Salm. typhi* consistently present to a titre of 1/8 or 1/16.
Case 20	*Salm. typhi*	17 months	None	Viable ova of *Schistosoma hæmatobium* present at each examination. Ova of *S. mansoni* observed on one occasion.	RBC and WBC present daily	H antibodies to *Salm. typhi* consistently present to a titre of 1/4 or 1/8.

Methods

Most of the methods used have been described in previous papers in this series. Some amplification is made below.

Urine Culture

A specimen of urine was collected from each carrier daily and plated directly on MacConkey's agar and on both MacConkey's agar and desoxycholate-citrate-agar after enrichment in both selenite F and a fluid MacConkey-mannite medium. Each day the strains isolated were identified by the biochemical reactions and by agglutination of a formalized broth culture to the titre of a specific H antiserum. During the treatment with sulphanilamide the media contained 5 mg. para-amino-benzoic acid per 100 c.c.

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Examination of Urine for Schistosoma Ova

If no eggs could be observed microscopically in the centrifuged deposit, attempts were made to observe miracidia. About 1 ml. of urinary deposit was diluted at least tenfold in cool, boiled tap water and the mixture placed in a bright light at 28° C. Under these conditions, ova hatch and motile miracidia can be observed with the naked eye, or with the aid of a hand lens, using oblique illumination and a black background.

TABLE II.—RESULTS OF COURSES OF TREATMENT

Patient	Hexamine	Sulphanilamide	Streptomycin	Chloramphenicol
Case 9	*Salm. paratyphi A* was not cultured from urine during treatment, but returned again immediately treatment ceased.	*Salm. paratyphi A* isolated from urine daily throughout treatment by enrichment methods only. Cultured on direct plating after treatment.	*Salm. paratyphi A* could not be cultured from urine during treatment but returned again immediately after treatment ceased.	All cultures negative throughout treatment and for 26 days after treatment ceased. Follow-up then ceased
Case 10 (first (treatment)	*Salm. typhi* absent or scanty during treatment and for six days after treatment ceased. Then heavy growth on direct plating daily.	*Salm. typhi* not isolated from urine during treatment, but isolated again immediately treatment ceased. Para-aminobenzoic acid not used in culture media.	*Salm. typhi* could not be cultured from urine during treatment, but returned again immediately after treatment ceased.	Not given in the first series.
Case 10 (second treatment)	*Salm. typhi* isolated from urine daily during treatment and daily thereafter. During treatment far fewer colonies were obtained on direct plating of a loopful of urine.	*Salm. typhi* isolated from urine daily throughout treatment by enrichment methods only.	*Salm. typhi* not isolated from urine during first five days of treatment; then isolated by enrichment methods during the last two. Present on direct plating daily after treatment.	*Salm. typhi* not isolated from urine during treatment, nor for six days after. Then isolated again daily.
Case 20	After the first day of treatment, *Salm. typhi* could no longer be isolated from urine. *Salm. typhi* isolated from urine on 16th and 31st days after cessation of course. Otherwise daily cultures all negative for seven months after treatment.	No further treatment given.		

COURSES OF TREATMENT

Several courses of treatment were given to two of the carriers. The other ceased to excrete *Salm. typhi* after one course. The courses used were as follows and were given in the order listed :

Hexamine ... ... 60 grains daily in divided doses for 2 weeks with acidification of the urine.

Sulphanilamide ... ... 6 g. daily for two days, followed by 4 g. daily for two days, followed by 3 g. daily for two days.
Alkaline urine maintained throughout.

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Streptomycin	2 g. daily intramuscularly, given in two doses, for seven days.
Chloramphenicol	$1\frac{1}{2}$ g. daily for fourteen days.

There were one or two months between each course of treatment. Case 10 received the series of courses twice; first, just after treatment of his schistosomiasis, and again one year later.

Results

The results obtained during the treatment of three chronic urinary carriers are shown in Table II. Antibodies were present in the urine of all cases during treatment despite negative cultures. Case 20 showed a slight diminution in urinary antibody titre months after cessation of carriage. Before treatment antibodies were present in the urine to a titre of 1/4 or 1/8. Six months after treatment antibodies were present in the urine to a titre of 1/2 or 1/4. During this six months daily culture of urine was negative.

Discussion

The drugs which effected an apparent cure of the carrier state were hexamine in one case (seven months follow-up) and chloramphenicol in one case (one month follow-up). While the patients received streptomycin, Salmonellæ could not usually be isolated from the urine, but they returned in undiminished numbers when treatment ceased. Despite the previous treatment of schistosomiasis in Case 10, treatment with two separate series of courses was completely unsuccessful. Treatment was far more successful in the two other cases who had schistosomiasis. This may indicate no connection between damage to the urinary tract by schistosomiasis and the carrier state. On the other hand Case 10 may have had severe, permanent damage to the urinary tract caused by schistosomiasis which was not affected by the death of the parasites.

Hexamine treatment in Case 10 effected a temporary sterilization of the urine the first time it was used but not the second. The organism may have developed a resistance to hexamine.

Case 20 may have been one in which persistent carriage was due rather to stasis and multiplication in the retained urine than to infected foci in the bladder. The existence of the former conditions is at least suggested by the uniformly large numbers of organisms passed by this carrier. Absence of the latter condition may account for the apparent successful action of a drug having a purely local effect. We cannot, however, explain the transient recurrence of excretion on 16th and 31st days after treatment was stopped.

Summary

Hexamine, sulphanilamide, streptomycin and chloramphenicol were used in the treatment of three chronic urinary carriers. Apparent cures were effected by hexamine in one case and chloramphenicol in one case.

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INFECTIVITY OF EGYPTIAN URINARY ENTERIC CARRIERS

BY

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THE importance of the chronic carrier of enteric organisms in initiating epidemics and outbreaks of typhoid and paratyphoid fever is well recognized. Less information is available concerning the exact mode of spread of the organisms from carrier to victim. The infectivity of the hands of carriers is a problem well worth investigating, and advantage has been taken of the existence of several urinary enteric carriers amongst Egyptians in order to experiment along these lines.

There is evidence that normal skin has disinfectant properties. Arnold and Gustafson (1930) and Karns and Arnold (1931) report that *Salmonella typhi* could not be recovered from the palmar surface of the clean hand ten minutes after immersion in a culture, although under the nails and along their lateral margins the bacteria persisted longer.

Squire, Cruikshank and Topley (1950) and Ricketts, Squire and Topley (1951) found that factors prejudicing the survival of organisms on the skin were: (1) drying; (2) the presence of unsaturated fatty acids (notably oleic acid); the influence of the former being predominant against Gram-negative organisms such as *Bact. coli* and *Ps. pyocyanea*, the latter against *Strep. pyogenes*, both factors contributing to the elimination of *Staph. aureus*.

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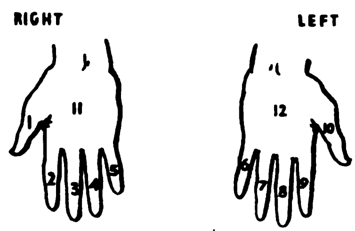
Payne (1949) found that the death rate of *Bact. coli* on the skin depended on the rate of drying, being maximal at humidities between 40 and 50 per cent. Survival at lower humidities was slightly longer and at higher humidities markedly prolonged.

Goffe (1950) found *Salmonella paratyphi A* on the hands of one of three urinary carriers five minutes after micturition, but no organisms could be recovered after twenty minutes. Of four carriers of *Salmonella typhi*, none showed organisms on their hands five minutes after micturition.

Preliminary Investigation of the Infectivity of a Single Carrier of *Salmonella paratyphi A*

Salmonella paratyphi A having been isolated from the urine of a native foodhandler subjected to routine bacteriological examination, the following investigation was performed on the carrier, on each of two successive days.

A specimen of urine was obtained, and cultured as a check on the passage of organisms on the day of the experiment. Immediately after micturition, moistened swabs were rubbed over the palmar surfaces of the carrier's hands. The swabs were numbered 1–12 and taken from various sites on the hands as depicted



in the diagram. The swabs were then cultured, and a number of significant isolations made, *S. paratyphi A* being obtained from—

(*a*) Swab No. 1 on one day.
(*b*) Swab No. 2 on one day.
(*c*) Swab No. 3 on both days.
(*d*) Swab No. 11 on both days.

Thus, six of twenty-four swabs taken immediately after micturition, from the hands which had not been subjected to previous washing, yielded *S. paratyphi A*. The urine samples collected on the days of the experiment gave fairly heavy growths of *S. paratyphi A*.

Indications were therefore evident that carriers might be infective by virtue of transmission of organisms on the fingers, and the following is an account of a series of experiments designed to enlarge upon the original observations.

Investigations on the Infectivity of a Number of Carriers

(*A*) *Principle and Outline of Method*

1. Control swabs were taken from the right and left hands of carriers immediately prior to micturition, to exclude the presence on the hands of extraneous

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Salmonellæ. In some cases (see below) scrapings were taken from the under-surface and lateral margins of the fingernails and the material obtained was cultured.

2. Specimens of urine were collected from the carriers and cultured as a check on the passage of organisms on the day of the experiment.

3. Various manœuvres were performed to determine the infectivity of these carriers.

(i) (*a*) Swabs were taken from the hands.

(*b*) Nail scrapings were taken from those carriers who had been subjected to corresponding control tests.

(ii) Carriers were made to rinse their hands in previously sterilized samples of milk, which had been poured immediately prior to handling into a sterile petri dish, the milk being taken as an example of foodstuff frequently handled by kitchen workers, and important as a vehicle in the spread of enteric infections.

(iii) Carriers rubbed their hands on sterile pieces of gauze cloth.

4. All the materials used for these tests were then cultured. It was considered that recovery of organisms from the hands, or transmission to the milk or cloths, would have the same significance in the assessment of carrier infectivity. Only one of these three manipulations was performed on any one carrier on a given day, the carriers being changed round so that each one would have his infectivity assessed by each of the three different methods. Certain comparative studies were introduced into the experiment.

(i) *Time Factor.*—The infectivity tests were in the first instance performed within two minutes of the carriers passing urine. Those carriers showing positive results under these conditions were subjected to similar tests delayed until twenty minutes after micturition.

(ii) *State of the Hands.*—Experiments in which infectivity was tested for by hand swabbing were performed both on "clean" and dirty hands, on separate days. For the "clean hand" experiments, hands were washed immediately prior to taking of the control swabs.

(iii) *Atmospheric Conditions.*—Figures were obtained for the shade temperature and relative humidity prevailing during some of the experiments.

Quantitative Investigations

A small amount of quantitative work was done during the experiment in an attempt to relate the infectivity of the carriers to the number of organisms passed in the urine. Unfortunately, on the days on which viable counts were done on the urine specimens no pathogen was isolated from the hand swabs or milk samples. The record of results (see below) does, however, contain some quantitative data concerning cloth handling.

(*B*) *Bacteriological Technique*

1. ***Culture.***—The principles of culture of all the specimens (urines, swabs, nail-picks, milk, cloths) involved—

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(i) Direct plating, immediately after collection or handling, on MacConkey agar.

(ii) Incubation in selenite broth, it being found that when the carriers' hands were not previously washed, an inhibitory medium was necessary to prevent an undesirable amount of colonies of *Coliforms*, *Sarcinae* and other contaminants appearing on the plates.

(iii) Plating of selenite broth cultures, on MacConkey agar, after incubation six, twenty-four and forty-eight hours. Modifications adapted to the nature of some of the materials and specimens were as follows :

(*a*) *Urines.*—The whole of a specimen was passed into a sterile blood transfusion bottle. Two samples were immediately taken into sterile universal containers, one for a viable count and the other for culture. As all the urines yielded significant growths after six hours' culture in selenite broth if not on direct plating, twenty-four hours' platings were unnecessary.

(*b*) *Swabs.*—These were stored in sterile tubes, to which, a few minutes before the use of swabs, sufficient broth (MacConkey-mannite broth—Archer & Ritchie, 1950—in all experiments except the preliminary one, where papain broth was used) was added thoroughly to moisten the surface of the swab. After rubbing over the hands the swabs were replaced in these sterile tubes and selenite broth culture carried out *in situ.*

(*c*) *Nail-picks.*—These consisted of sharpened orange-sticks moistened and stored in the same way as the hand swabs. It was found that they could be rubbed over the surface of the plates without creating too much disturbance in the surface of the medium.

(*d*) *Milk samples.*—After being handled by the carriers, these were placed in sterile universal containers, diluted approximately one in four with sterile isotonic saline to avoid the material to be subsequently spread on agar being too dense, plated directly, and then incubated in a roughly equal volume of selenite broth. Further platings on MacConkey agar were made at intervals six, twenty-four and forty-eight hours after addition of selenite broth.

(*e*) *Cloths.*—These consisted of pieces of gauze about four inches square, sterilized and stored in universal containers. Immediately before use the cloths were moistened with selenite broth. The carriers removed the cloths and rubbed their hands on them, care being taken to see that the interdigital spaces were included in the handling. The cloths were replaced in the containers by the natives ; 5 ml. of selenite broth were now added to the container and after vigorous shaking plated directly on MacConkey agar. Further plating was carried out at the same time intervals as used for the milk samples.

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2. *Controls.*—It was considered that swabbing of the hands was sufficient to control subsequent milk and broth experiments. Handling of a control sample of milk would necessitate subsequent washing and drying of the hands, which would involve more risk of altering their state before the infectivity tests were carried out.

3. *Reading of Plates.*—This was carried out at intervals of twenty-four and forty-eight hours after inoculation. Suspicious colonies were subjected to slide agglutination, at once if the growth was sufficiently profuse, or after subculture if only one or two colonies were present. The identity of positive reactors was confirmed by their biochemical behaviour and agglutination to titre.

4. *Viable Counts.*—These were performed by a modification of the Miles and Misra (1938) surface count method, using 40 dropper pipettes, dilutions of urine ranging from 10^{-1} to 10^{-6}, and MacConkey agar in six-inch diameter Petri dishes. Plates were read after twenty-four hours, no advantage being found in incubating for forty-eight hours.

Results

No organisms of the Salmonella group were isolated from any of the control swabs taken prior to micturition.

Of the 12 carriers taking part in the experiment, 7 were shown to be infective, following micturition, by virtue of carrying the organism excreted in their urine on their hands (4 cases) or by transmitting it to milk (1 case) or cloth (2 cases).

Analysis of results along several different lines brought out a number of interesting facts.

(*a*) *Species*

(i) Of 5 carriers of *S. typhi*, 3 were shown to be infective, 1 by transmission to milk and 2 by contamination of cloths.

(ii) Of 7 carriers of *S. paratyphi A*, infectivity was demonstrated in 4, in all cases by the recovery of the organisms directly off the hands.

(*b*) *Time Factor*

The 7 "positive" carriers were all infective when tested two minutes after micturition, whereas only 1 of 6 positive carriers tested twenty minutes afterwards carried organisms (*Salmonella paratyphi A*) on his fingers, those carriers who had transmitted bacteria to milk and cloths two minutes after micturition not repeating the performance when tested at twenty minutes.

(*c*) *State of the Hands*

Three of the infective carriers had "clean" hands at the time of testing, these all carrying *S. paratyphi A* on the hands. The remaining four, one with *S. paratyphi A* on the hands, one transmitting *S. typhi* to milk and two transmitting the same organism to cloths, had dirty hands. No tests were done with the milk and cloths when the hands were clean.

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(*d*) *Atmospheric Conditions*

Table I shows the proportion of positive isolations from a number of tests performed within two minutes of micturition, at various temperature ranges.

TABLE I

Temp. Range ° C.	*No. of tests*	*No. of positives*
17.5–18.5	11	3
21.0–24.5	20	1
25.5–32.0	9	2

Table II shows a similar analysis for two different humidity ranges.

TABLE II

Humidity range (percentage)	*No. of tests*	*No. of positives*
19–29	16	5
38–56	24	1

(*e*) *Frequency of Positives*

Although 7 of 12 carriers proved infective, the 8 significant isolations (1 carrier positive on two occasions) were only made from a total of 62 infectivity tests, distributed as follows :

Swab tests :	27	5 positives.	All *S. paratyphi A*
Nail tests :	13	No positives.	
Milk tests :	11	1 positive.	*S. typhi*
Cloth tests :	11	2 positives.	Both *S. typhi*

The total number of infectivity tests performed on the positive carriers was 42.

Quantitative Results

The two carriers of S. *typhi* who transmitted organisms to pieces of cloth were excreting, on the day of the test, 50,000 and 470,000 organisms per ml. respectively. On the same day, three *S. paratyphi A* carriers, tested in the same way but all with negative results, were passing respectively 8,000, 4,000 and 8,000 organisms per ml., but on another day two of these three *S. paratyphi A* carriers when passing 300,000 and 45,000 organisms per ml. did not transmit organisms to cloth when tested, as above, within two minutes of micturition. The previous state of the hands (unwashed) did not vary noticeably from one day to the other.

Regarding the extension of the quantitative data to the transmission of organisms, it was noted that the number of organisms obtained off the hands was usually small, the one exception to this being in the case of the preliminary investigation, when on one occasion a profuse growth of *S. paratyphi A* was obtained from the palm of the right hand (Swab No. 11). By contrast, the positive milk and cloth cultures yielded numerous colonies on plating at corresponding time intervals. This suggests that these methods of assessing infectivity might lend themselves to quantitative analysis, especially in the case of the milk, where dilutions could be easily made and viable counts performed at different times after handling.

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Discussion

It will be seen from the results that eight significant isolations were made from forty-two tests on the carriers whose infectivity was proved. This indicates that one of these carriers would, on the average, be capable of contaminating some suitable article of food once in every five occasions on which he returned to foodhandling duties immediately after micturition. Assuming, conservatively, the latter event to occur once during a day's working hours in the cookhouse or canteen, each of these carriers might, over a period of five days, introduce pathogenic organisms into the food and so initiate a separate epidemic. The fact that epidemics do not occur with this frequency may well be due to chance events such as delays in returning to duty after visiting the latrine, cookhouse procedures, such as heating of infected foodstuffs and precautionary measures such as washing the hands or immersing them in disinfectant.

Factors determining the infectivity of a given carrier at any one time might include—

(i) species of organisms carried ;
(ii) number of organisms passed ;
(iii) state of cleanliness of the hands ;
(iv) the use of disinfectants ;
(v) season and climate.

Taking the first three of these factors together, the results show that although there was no marked difference between the proportion of *S. typhi* and *S. paratyphi A* carriers proved infective, the distribution of positive results among the various tests of infectivity was interesting, in that all the *S. typhi* isolations were made from cloth or milk, whereas the paratyphoid organisms were obtained solely off the hands by direct swabbing. Again, while "clean" and dirty hands showed no appreciable difference of infectivity, it is noteworthy that all the typhoid isolations were made from carriers who had dirty hands at the time of testing, while the *S. paratyphi A* organisms were isolated from "clean" hands in three of the four cases.

The recovery of organisms from the cloths handled by two *S. typhi* carriers excreting 50,000 and 470,000 organisms per ml. set against the apparent non-infectivity of three *S. paratyphi A* carriers passing much smaller numbers of organisms (4,000–8,000 per ml.) suggests the influence of numbers in determining infectivity. But on the other hand, the fact that two of these *S. paratyphi A* carriers were also non-infective when excreting organisms in numbers comparable to those passed by infective typhoid carriers (i.e., 45,000 and 300,000 per ml.) might lead one to believe that species is important in determining infectivity, *S. typhi* being more readily transmitted than *S. paratyphi A*.

Varying behaviour according to species might account for the observed discrepancy, in Egypt, between the number of carriers of *S. paratyphi C* (frequent) and the incidence of cases of disease caused by this organism (rare). Unfortunately, the only *S. paratyphi C* carrier available at the time of these

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experiments was passing organisms intermittently, and therefore could not be relied upon for infectivity tests.

The number of observations made, however, is small, and the figures are not suitable for statistical analysis. More quantitative observations are necessary. It would be interesting to observe the influence of disinfectants, especially those commonly used in cookhouses, in reducing the infectivity of these carriers. To determine a significant difference, however, a large number of tests would have to be done, bearing in mind the low frequency of positives (1 in 5) with undisinfected hands.

In view of previous experiments, by Payne (1949) on the influence of humidity and by Ricketts, Squire and Topley (1951) on the effect of drying, on the survival time of organisms on the skin, it might be thought that the carriers would be more infective at high temperatures, when their hands would be more moist from sweat, and also that they might be least dangerous at a humidity of 46 per cent. or thereabouts, their infectivity increasing slightly at lower humidities and markedly at higher ones. Table II presents an interesting comparative study on the influence of the lower humidities. It must be borne in mind, of course, that Payne's experiments are concerned with *Bact. coli* in broth culture diluted with Ringer's solution, whereas the present series involves enteric pathogens in urine.

Summary and Conclusions

1. Of 12 Egyptian urinary enteric carriers, 7 were proved infective after micturition by virtue of the carriage of organisms on their hands. The carriers were found capable of infecting milk and pieces of cloth, from either of which articles infection might be further transmitted so as to initiate epidemics.

2. On the average, infectivity of these carriers was established once in every five tests.

3. The danger from the carriers within two minutes of micturition is very evident, but there is a sharp fall in infectivity during the succeeding fifteen to twenty minutes.

4. Both *S. typhi* and *S. paratyphi A* carriers were proved to be infective, there being slight and possibly unimportant differences in the behaviour of the two species.

5. The possible influence of a number of non-specific factors on infectivity is discussed.

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LACK OF VITAMINS IN THE WAR-TIME ARMY DIET

BY

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[The following paper was accepted for publication in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS in June, 1946. Subsequently it was lost owing to circumstances beyond the Editor's or the author's control. A copy of the manuscript has now been retrieved and it is published in its original form, since revision in the light of the recent literature would not alter the conclusions made.]

THE vitamin content of soldiers' food has received careful consideration during the last war, but vitamin deficiencies were still seen. This paper was written with the purpose of drawing attention to this fact, and it is hoped that comprehensive investigations will be stimulated. The observations were based on over four years' experience with the Army abroad, in India, Iraq, Persia, Palestine, Syria, Egypt, Sicily, Italy, Belgium, Germany, and on board H.M. Troopships. Nearly all this time was spent with one Infantry Division, mostly as Regimental Medical Officer. Gross deficiency diseases were not a problem in these areas, but mild varieties, often overlooked and sometimes suggesting neuroses or malingering, were prevalent. These were mostly seen in Regimental Aid Posts and Field Ambulances. Those better qualified for such studies did not have opportunities of observing them, and this is perhaps a sufficient excuse for writing this paper. It is a somewhat incomplete account, and inaccuracies may have crept in, for few publications were available when the observations were

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made, and it was necessary to rely on scanty notes and memory when medical literature became accessible.

It is intended, firstly to point out difficulties in estimating the real vitamin intake of soldiers, secondly to point out difficulties in estimating the real vitamin requirements of soldiers, and thirdly to describe signs and symptoms suggesting vitamin deficiency.

Lack of the Vitamin B complex appeared to be the most conspicuous shortage. Vitamins often occur together in food, and avitaminoses are usually caused by the lack of several of them ; but Army rations form a very artificial diet, and it is quite possible that certain vitamins in it were adequate to requirements, while others were not.

The Vitamin Content of Food

Soldiers seldom take in all the vitamins theoretically contained in their food. Fads and fancies exist in the Army the same as everywhere else, and few soldiers eat everything that is put before them. In civilian life and in certain base areas natural instincts and appetites often help to balance an otherwise inadequate diet, but under active service conditions this is seldom possible.

In hot climates appetite generally decreases. According to Rush (1944), only 2,281 calories were ingested on average by a group of soldiers in the tropics, although 3,200 calories were provided ; and there was suggestion of deficiency of Vitamin B_1, Vitamin C, calcium, and perhaps riboflavin.

Transporting, preserving, cooking, and storing of food often causes serious loss of vitamins.

1. Vitamin B_1 and Vitamin B_6 are destroyed by alkali (Martindale, 1943). Yeast preserves these vitamins, owing to its faint acidity, but alkaline baking-powders destroy them. The latter are more easily available to Army cookhouses than yeast (although Army bread is made with yeast), and bicarbonate of soda, or even alkaline "health salts," are often used by Army cooks for baking.

2. Riboflavin is reduced by strong light and ultra-violet rays (Martindale, 1943). On active service fresh food is often stored in the open, and such destruction may take place, especially in tropical and subtropical countries.

3. Vitamin C oxidizes in the presence of heat and light, and it is unstable in alkaline media (Martindale, 1943). Much of it can be destroyed not only by storage in the open, but also by cooking in open containers in the sun.

4. Tinned food loses some of its vitamins. Tinned bacon (Report, 1944) and corned beef probably contain much less of the Vitamin B complex than fresh products. According to Bicknell and Prescott (1942), 22–67 per cent. of riboflavin is lost in "canning." Thompson *et al.* (1944) found considerable variations in the riboflavin and pantothenic acid content of various samples of the same tinned fruit ; and their figures for the riboflavin and pantothenic acid content of tinned food are on average about 30 per cent. below those given by Bicknell and Prescott for the same food in fresh condition.

5. Fresh fruit and vegetables are often damaged in transport. During the

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winter and spring of 1944 in Italy, apples or oranges were provided daily; but they were carried in sacks, and they were often uneatable and always unattractive when they arrived in forward areas.

6. Vitamins are often poured away. Brush *et al.* (1944) found that the liquid and solid matter in tinned fruit and vegetables contained roughly proportionate amounts of Vitamin B_1 and riboflavin. Hinman *et al.* (1945) found that 30–40 per cent. of Vitamin B_1 and riboflavin was lost when liquids were discarded in small scale preserving. Most Army cooks pour away the liquid contents of tinned vegetables, and some do so with the liquid used for cooking fresh vegetables. Much of the juice of tinned fruit is also wasted.

It is doubtful whether allowances were made for all the above factors when soldiers' rations were planned.

Vitamin Requirements

Vitamin requirements vary considerably even under normal conditions, and there are discrepancies in the average daily requirement figures or "safe" intake levels given by different authors. Furthermore, these "safe" levels were arrived at by calculating averages of many estimations, and there is reason to believe that the assumed vitamin content of Army rations was considered satisfactory by comparison with such figures (Report, 1944). This means that all those whose vitamin requirements were for physiological or pathological reasons well above the average were from the start doomed to receive less than they needed.

The discrepancies in dietetic requirements of Vitamin B_1 were explained by Najjar and Holt (1943), who have shown that production of Vitamin B_1 by bacteria takes place in the human bowel, that this vitamin is absorbed from the bowel, and that some individuals produce more of it than others. They have also shown that sulphonamides destroy the vitamin-producing bacteria. (Sulphonamides were extensively used in the treatment of war wounds, infections, diarrhœa, dysentery, etc., and they may have had an adverse effect of the Vitamin B_1 balance of some patients.)

Vitamin B_1 requirements increase with a raised intake of carbohydrates (Reinhold *et al.*, 1944). During the war the Army diet always contained much carbohydrate, and in cold weather or at high altitudes above sea-level, additional sugar, chocolate and bread were provided.

Fevers and prolonged muscular activity increase the Vitamin B_1 requirements of the body (Beaumont and Dodds, 1943). Malaria, sandfly fever, diarrhœa, and dysentery were frequent in tropical and subtropical countries, whilst respiratory infections were common in colder climates.

According to Booher (1939) riboflavin requirements are closely related to the amount of active tissue in the body; muscular activity may have thus contributed to the production of an adverse riboflavin balance.

Generally speaking, Vitamin B_1, nicotinic acid and riboflavin are all concerned with the continuous processes of cellular nutrition; one of their functions

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is that they are components of co-enzymes which are used up, and therefore, they require continuous replacement (Sydenstricker, 1941). But the vitamin reserves of the body are small. There is, thus, on purely theoretical consideration, reason to believe that the vitamin intake of many soldiers must at times have been inadequate to their requirements.

Signs of Vitamin Deficiency

Let us now consider the signs and symptoms which suggest that there really was a deficiency of vitamins, especially those of the B complex.

The Diet

In view of what has been said above, figures as to the *assumed* vitamin content of the Army diet would be of no use here. The picture is further confused by the fact that at times local restaurants were in easy reach and local fruit could be bought. It was, of course, impossible to determine the actual vitamin intake under active service conditions, but it is intended to contemplate the relationship between external conditions (dietetic and others), and the appearance of features suggesting mild avitaminoses.

In certain base areas, and on rare occasions in action, the diet contained fresh meat, some fresh fruit and vegetables, and occasionally fresh eggs and butter. Under active service conditions (even if there was no fighting, as in Persia), and during long road and train journeys (some of which lasted two to three weeks), the diet usually consisted entirely of the following :

White bread or biscuits	Corned beef
Flour	Tinned sausage-meat
Rice	Tinned bacon
Porridge	Tinned meat and vegetable stew
Tinned or dried potatoes and vegetables	Tinned processed cheese
Tinned or dried fruit	Tinned fish
Chocolate (sometimes with added Vitamin A)	Tinned margarine
Jam or syrup	Condensed milk
Sugar	Tea
	Salt and condiments

"Compo" rations, containing a variety of cooked, tinned, food, but hardly any fruit and vegetables, and no fresh food of any type, were issued at certain times.

The diet always had a high protein value and, a few brief periods excepted, it always had a high calorie value (about 3,200-3,600 calories). Very rarely, small quantities of Vitamin C, Vitamin B_1, riboflavin, and nicotinic acid were issued in tablet form. Fresh fruit and vegetables were seldom issued in abundance.

Outbreaks of conditions suggesting vitamin deficiencies invariably occurred when—

(1) all, or nearly all, the food was tinned ;
(2) local procurement of food was limited or impossible ; and
(3) vitamin tablets were not supplied or not taken.

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Such a diet will be called a "poor diet" in the following paragraphs ; a diet containing an abundance of fresh fruit and vegetables with some fresh meat and milk products will be called a "good diet."

The Clinical Picture of Vitamin Deficiencies

A large number of minor conditions seen in Medical Inspection Rooms abroad appear to be connected with lack of vitamins in the diet. Such minor conditions are, epidemic outbreaks and battle casualties apart, often the chief concern of Medical Officers. They are either connected with objective signs, especially from the skin, or else they consist of vague subjective symptoms without physical signs. As a rule the former are accepted with stoic indifference by patients, doctors, and orderlies, as an inevitable affliction of war ; the latter are treated with sedatives and reassurance, light duties, iron and arsenic tonics, threats, or red ink, according to the Medical Officer's disposition. The fact that both groups show definite up and down trends is generally recognized ; it was observed, however, that these trends were generally parallel with changes of the diet. Whenever the food was good, the troops were fit, though other factors may have contributed ; when food was poor, these conditions appeared, even whilst troops were housed in good billets and having an easy time (as in the early part of 1946 in Germany).

Skin conditions.—Not counting parasitic diseases like scabies or ringworm, these were chiefly—

(i) Superficial purulent conditions.
(ii) Desert sore.
(iii) Dermatitis.

Dirt, insect bites, cactus thorns, and abrasions caused by working with weapons and vehicles, all played a part in producing superficial purulent conditions, but there was also a definite connection with the diet. "Everything turned septic" when the diet was poor, though some men showed more resistance than others. When food was good, even dirty cuts healed up rapidly.

Boils formed a distinct group. Nearly everybody had a few small furuncles at one time or another. In the course of eighteen months, about 100 out of about 700 men in one regiment had definite outcrops of furuncles, lasting weeks or months, and often associated with severe carbuncles.

Boils were first observed on a large scale in Persia. Rations were extremely poor, and living conditions not much better than those of nomads. For about six weeks any amount of fruit, nuts and vegetables could be obtained from local sources, and there were few boils. Their incidence began to increase within about a fortnight of a move to another part of the country, where living conditions were almost identical (though the weather had turned colder), but where local purchase was restricted to a small quantity of eggs and nuts and large quantities of sticky sweets.

The problem with these boils was not their immediate treatment, for they mostly healed up, whatever was applied to them, but it was difficult to prevent patients from getting one boil after another. Rest, daily showers, and a reduction

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of the carbohydrate intake were all helpful, but seldom practicable. Untreated boils often developed into desert sores. In a search for some general "tonic," yeast was finally resorted to, following a patient's report that a Casualty Clearing Station had successfully cured his boils with it.

About 10-15 grains of chopped and dried baker's yeast were given three times daily for fourteen to twenty-one days. Local dressings (mostly fomentations with sodium sulphate or kataplasma kaolini) were continued. Oral administration of yeast was sometimes followed by an initial outcrop of boils, but complete cure followed in all cases within about three weeks; and, generally, boils seemed to soften up quicker, producing thinner, cleaner-looking pus, as soon as the treatment was begun. Some fifty patients were treated with yeast by mouth, and no failures can be recalled (unless memory or scanty notes are playing tricks). There were some relapses, perhaps 30 per cent., after several weeks or months, but all these were again easily controlled by further administration of yeast by mouth.

Desert sore has been widely discussed, and the opinion that it is caused by Vitamin C deficiency was widespread in the Middle East. [Others, like Bettley (1943), disagree with this view.] The incidence of desert sore, however, definitely increased whenever the diet was poor, suggesting that lack of vitamins did play a part in its etiology. Other factors must have contributed, for desert sore did not appear outside tropical and subtropical countries.

An unusually large number of men suffered from symmetrical patches of red, occasionally desquamating, dermatitis, suggesting nicotinic acid deficiency, and of seborrhoic accumulations at the naso-labial folds, the alae nasi, or the vestibule of the ear, suggesting riboflavin deficiency. Dry, rugose, desquamating skin on the scrotum was also often seen, and this is one of the more frequent pellagrous manifestations (Bicknell and Prescott, 1942). At times there were four or five such fresh cases every week, out of a total of about 600 men. Fissures near the angle of the mouth, another sign of riboflavin deficiency (Beaumont and Dodds, 1943), were also seen. Finally, the frequency of contact dermatitis in the Army may perhaps also be connected with a Vitamin B complex deficiency.

Conjunctivitis.—There was every reason for men to develop conjunctivitis in this war—the sun, dust, wind, and smoke all contributed. But at times so many men were complaining of itching and burning of the eyes, a sensation of roughness of the conjuctivæ, lacrimation and photophobia as to suggest the possibility of other causes. At other times, in spite of dust and wind, there were few cases of conjunctivitis. All these symptoms frequently appear with riboflavin deficiency (Bicknell and Prescott, 1942), and lack of this vitamin may have played a part in causing them. More definite ocular signs of riboflavin deficiency, blurred vision and inability to see in dim light, were also seen, but it cannot now be recalled whether they always appeared after the diet had been bad for a while.

Diarrhœa was so frequent that it is impossible to make definite deductions from its incidence. All men suffering from diarrhœa without blood and mucus were treated as infectious cases; if they failed to recover with saline purges and

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kaolin, or sulphaguanidine tablets, they were sent to Medical Units for further investigation. Some of these whose stools were bacteriologically negative and who recovered after rest in hospital, and all those who continued to have mild diarrhœa for weeks and months, in spite of repeated negative endoscopic and microscopic examinations, may have suffered from undetected Vitamin B_1 and nicotinic acid deficiencies.

Acute Ulcerative Gingivitis.—It has been suggested that this is a result of nicotinic acid deficiency (King, 1940). The worst, and only important, outbreak observed was in Germany in spring and summer, 1945. It appeared when the diet was unusually good, and it almost disappeared at the beginning of 1946, when the diet became poor. This improvement seems to have been a result of energetic hygienic measures. The conclusion reached by Coulson *et al.* (1945) that nicotinic acid amide deficiency plays no part in the development of acute ulcerative gingivitis seems to have been thus borne out.

Mild Subjective Symptoms.—All observations were made among men whose morale was consistently good. Malingering was rare, and its presence, as well as its causes, were usually easily detected after a certain amount of friendly cross-questioning. At any rate, few soldiers are so stupid as to report sick with vague symptoms ; if they do stoop to feigning disease, they usually manage to think up something intelligent, like a one-sided acute conjunctivitis caused by putting a little cigarette-ash into one eye. Neuroses seldom take the shape of isolated mild symptoms, and they are again easy to detect among men whom one knows. It is, therefore, thought that the familiar complaints of loss of appetite and strength, vague abdominal pain, muscle cramps when heat was not excessive, intercostal neuritis and other nerve pains, burning sensations, numbness and tingling of the limbs, palpitations, dyspnœa, dizziness, nervousness, depression, absent-mindedness, and vague apprehensions, were more often than not due to vitamin shortage. They were certainly the most common after periods on a poor diet, and they have all been frequently described as early signs of various vitamin deficiencies, especially of the Vitamin B complex.

The therapeutic effect of yeast was not tried in more than a handful of these cases, but these were improved by it. Yeast could only be obtained from field bakeries by much persuasion, and it was reserved for boils, the most serious problem of all, and one known to benefit from it.

Contributing Factors

The impression was gained that the following conditions were also associated with an increased incidence of the above-mentioned symptoms :

Intense cold.
Intense heat.
Physical hardships and lack of sleep.
Convalescence from febrile diseases.
Diarrhœa, especially mild, chronic, cases.

All these conditions are usually connected with an increase of vitamin requirements, or a reduction of their intake, or both.

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Troopships

Troopships were generally overcrowded. There was every reason for Other Ranks to get "run down" on long journeys, as they lacked exercise and entertainment, and their food was usually monotonous and unappetizing ; but there was always a fair proportion of fresh fruit and vegetables (stored on ice), and the calorie value of the diet was lower than on land. A reduction of vitamin requirements owing to lack of exercise can also be assumed. On shorter trips, lasting ten to fourteen days, all the above conditions improved towards the end of the journey, and on long ones (one of which lasted ten weeks) they were almost non-existent.

COMMENT

Nearly all the signs and symptoms described above are commonly associated with being "run down." Food was often the least satisfactory when general conditions were worst, and exertion, fear, and disease may have contributed by increasing the vitamin requirements of the body. But there must be some mechanism causing the "running down" of the body, and "fatigue" is hardly a less vague term. If we could say that the body has exhausted its scanty reserve of vitamins (known to last only seven to fourteen days in the case of some of them), we might get nearer to understanding the effect of prolonged hardships.

"Neurosis" is sometimes another convenient and vague label. Its existence and importance are not denied, but it is thought that many tropical neuroses and neuroses of convalescence are simple deficiency diseases, and that vitamin lack may have played some part in many neuroses of war. Especially the mild cases, which recover on "rest, sedation, and good food," suggest this. After all, rest and sedatives reduce the metabolism of the body, and therefore its vitamin requirements, and good food implies an adequate vitamin intake.*

A reduction of their vitamin requirements may have helped patients suffering from dermatitis, diarrhœa, septic conditions, etc., to recover when they were put to bed. Hospital food is often better cooked, too, with less destruction of vitamins.

Unless we assume some obscure curative powers, the fact that boils improved after oral administration of yeast suggests that a Vitamin B complex deficiency may have contributed to their development. The use of yeast in furuncles and carbuncles is only briefly mentioned in a few text-books on diseases of the skin, and only a single reference could be found to the effectiveness of vitamins, "consequential to their lack" (Sutton and Sutton, 1939). Perhaps under civilized conditions boils are seldom caused by vitamin lack. A careful search of the medical literature of the last ten years revealed the existence of only two papers on the use of yeast in purulent processes, both of which were published in Russia, and are not accessible. It is open to conjecture which of the vitamins contained in yeast is effective in the treatment of boils. Experiments on this subject might be instructive.

Bettley's (1943) assumption that lack of vitamins played no part in the develop-

* *Note added in* 1952. Selye's "general adaptation syndrome" (THE PRACTITIONER, 1949, 163, 393) may have played a part in causing the signs and symptoms described in the present paper.

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ment of desert sore was based on the facts that desert sores existed in the Middle East before the war, and that clinical evidence of known vitamin deficiency was not common in the Middle East army. This is not conclusive. Vitamin deficiencies might have existed, and probably did exist, before the last war; and a thorough search for the milder and earlier symptoms of vitamins deficiency may have shown these to be prevalent in the Middle East army even in the absence of definite disease complexes.

Finally, it may be worth mentioning that the United States Army in Italy and North Africa was in no comparable way afflicted with desert sore and boils, although personal hygiene in the field was undoubtedly better among British troops. As far as it could be ascertained in Italy, the United States Army diet was prevalently tinned, with a very high carbohydrate content; but lemonade powders with added Vitamin C, sweets including Vitamin B complex, and large amounts of peanut butter, which contains much Vitamin B complex, were provided.

Summary

1. There is reason to believe that during the last war the British Army received insufficient vitamins.

2. This is thought to be due to fallacies in estimating the actual vitamin intake, as opposed to theoretical vitamin contents of the diet, and to considerable variations in individual vitamin requirements under varying conditions.

3. Features, suggesting the existence of mild vitamin deficiency among soldiers and appearing when the vitamin content of the diet was persistently low, are described.

4. Curative properties of dried baker's yeast in boils are described and discussed.

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UNEXPECTED RESPONSES OF ACTIVELY IMMUNIZED MEN TO A BOOSTING DOSE OF TETANUS TOXOID

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LITTLE work has been done to determine the effect of successive injections of tetanus toxoid in individual persons. In a study of a small group of adults actively immunized with tetanus toxoid, Evans (1943) found that in no instance was the antitoxin titre eighteen months after the third injection lower than it was four months after the second; in four of eleven persons it was definitely higher. The second injection was given nine weeks after the first, and the third injection ten months after the second.

During a recent investigation into methods for the prevention of clinical tetanus, we have been able to study the effect of boosting doses on men who had received varying numbers of injections of tetanus toxoid previously. Some results have already been reported and are in course of publication in the Proceedings of the Royal Society of Medicine (Sachs, 1952). The work recorded here was not reported owing to shortage of time, and appears to us to be of sufficient interest and importance to justify the publication of a short note. The results of the complete investigation will be published in the near future.

This part of the investigation was designed to determine the effect of a boosting dose of toxoid injected either alone or at the same time as 500 units of tetanus antitoxin given in a different site. The volunteers concerned were bled before and at certain fixed times after injection, a few being bled as late as six months after injection so that an idea of the duration of immunity could be obtained from measurement of the antitoxin titre at this time. It should be mentioned that the six-month blood sample was obtained from these particular men because it was anticipated from their earlier responses to the injection, that information of practical importance would be obtained thereby. They do not therefore constitute a random sample. All the men received the boosting dose, with or without an injection of tetanus antitoxin, during the months of February, March or April, 1951.

Table I shows the antitoxin titres of these men at the time of injection, ten to twelve days, two months and approximately six months later: the titres are correct to approximately ± 10 per cent. The men are divided into three groups: those in *Group A* received their first boosting dose in this investigation, those in

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Group B had previously received one, and all in *Group C* had received two or more boosting doses previously. The first boosting dose is here defined as the third injection of the initial course of immunization, given six to twelve months after the second dose.

The table shows that all the men in *Group A* had higher titres six months after injection than they had at the time when the injection was given. The first man (3/4) was judged by his pre-injection titre to be a good responder, for he had some circulating antitoxin present twelve years after the second injection of the initial course. Six months after the boosting injection his antitoxin titre was higher than those of three of the four men who received the third injection within

TABLE I.—THE RESPONSE OF ACTIVELY IMMUNIZED MEN TO A BOOSTING DOSE OF TETANUS TOXOID INJECTED DURING FEBRUARY–APRIL, 1951

Group A had previously received two injections of tetanus toxoid ;
Group B had previously received, in addition, one boosting dose ; and
Group C had had more than one boosting dose.

Immunization Dates				Antitoxin Titre (Units/ml.)			
Man	Group	First two Injections	Last Boosting Dose	0 Days	10–12 Days	2 Months	6 Months
3/4	A	1939	Nil	0.02	2.1	0.70	0.23
1/11	A	1950	Nil	<0.01	1.5	0.40	0.04
3/2	A	1950	Nil	<0.01	0.70	0.30	0.08
8/7	A	1949–50	Nil	<0.01	1.5	0.60	0.13
1/13	A	1950	Nil	0.12	4.5	1.9	1.0
8/11	B	1946	1947	0.40	19	12	3.6
8/13	B	1946	1946	0.04	27	19	13
1/1	C	1940	1945	0.70	32	9.5	0.90
4/3	C	1943	1950	1.0	3.5	1.8	0.95
8/1	C	1941	1950	3.2	4.0	2.7	1.9

fifteen months of the second. These three men appeared, however, to be poor responders to immunization, for they had no detectable circulating antitoxin at the time of their third injection. The fourth man, 1/13, is clearly a good responder to immunization with tetanus toxoid.

In *Group B* both men showed relatively high titres ten days after the injection of toxoid, but the losses occurring between the second and sixth month showed a marked contrast. These men had somewhat similar immunization histories, but the figures in the table suggest that 8/11 might continue to show a fairly rapid loss after the sixth month, while the rate of loss in 8/13 had already shown an appreciable slowing down. Their six-month titres were the highest of any recorded in the table.

It is, however, *Group C* that provides the result of greatest importance. The three men in this group had all received two or more boosting doses prior to the injection given in this investigation. It will be noted that the titres six months after injection were very little different from those recorded before injection. In

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1/1, the six-month titre was slightly higher than that before injection, in 4/3 it was the same within the limits of error, and in 8/1 it was definitely lower.

It is a matter of some importance that a boosting dose of toxoid can confer little or no benefit as judged by the antitoxin titre six months later and that an adverse effect can be produced in some persons. Greenberg (personal communication) agrees that in certain circumstances an injection of prophylactic may be harmful.

The histories of these men will be considered briefly. The second man (4/3) had received two boosting injections in 1950; the second of these was administered six months before the dose given in this investigation. It is therefore possible that appreciable loss of antitoxin was still occurring, and we can only conclude that had he not received a boosting dose, his antitoxin titre might have fallen further.

In the case of 8/1, who received tetanus toxoid and antitoxin in different sites, the early response to the boosting dose of tetanus toxoid was interfered with; it was thought that crowding-out occurred because of a rapid production of precipitin in response to the injection of horse antitoxin-protein, to which he had some immunity as a result of a previous injection. His response to injection will be considered fully in the report presenting the complete results; this was the only case in which such interference occurred. It is disturbing to note that his antitoxin titre six months after active-passive immunization was appreciably lower than that found nine months after the previous boosting dose given in 1950. If this result is in any way attributable to the antigenic effect of the injection of heterologous antitoxin-protein, a similar result might be expected to occur in some persons injected with a combined prophylactic, if they had marked basal immunity to one component: a suppression of the response to other components might also occur.

The case of 1/1 is, however, the most disturbing. There is no reason to doubt the accuracy of the immunization history: he had received no injections of tetanus toxoid for about six years. The titre measured at the time of injection in this investigation (0.7 unit per ml.) must therefore have been almost stationary. A very high level of antitoxin (32 units per ml.) was found ten days after injection, and a very considerable fall occurred thereafter, so that the titre found six months after injection (0.9 units per ml.) was hardly higher than that existing before the injection was given. The magnitude of the loss that occurred between the second and sixth month after injection suggests that further loss might continue at a considerable rate, so that his titre might fall below the steady level present before injection.

It should be remembered that these volunteers were specially selected and that this unfavourable result may be uncommon. It is also possible that the next injection received by these men may raise the permanent level of circulating antitoxin eventually reached to a higher level once again. It is, however, also possible that harm might be done by repeated injections of prophylactic after a certain level of immunity had been attained, unless larger doses were given. More work could profitably be done on this subject, for the possibility, however

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remote, of a progressive lowering of the level of immunity after successive boosting doses, is of paramount importance when considering reinforcing doses of an immunizing agent.

It is also of interest to note the great contrast between the six-month titres of men who had reached high ten-day values. One of these (8/13) had 27 units per ml. ten days after injection, and showed a fall only to 13 units per ml. at six months ; 1/1, however, who had 32 units per ml. ten days after injection, dropped in titre to 0.90 units per ml. after six months. This result shows clearly that the titre at the peak of the response may give no indication of the titre at a later stage, and does not therefore provide reliable information of the duration of immunity.

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Matters of Interest

THE QUARTERLY JOURNAL

Lieutenant-General F. Harris, D.G., A.M.S., writes :

"As Chairman of the Journal Committee, I should like to thank Lieutenant-General Sir Treffry Thompson for his work as Editor during the last two years. The post-war depression has severely hit the Journal, but there can be no doubt of Sir Treffry's influence for good upon the number and quality of papers submitted. If the subscribers had kept pace with contributors, the outlook would indeed be happy. As the Journal enters its fiftieth year under its seventh editor, though now as a quarterly, I appeal to all our subscribers to continue their support and to use their endeavours to increase its circulation."

ROYAL SANITARY INSTITUTE

The Royal Sanitary Institute has accepted an invitation from the Corporation of Hastings to hold the 1953 Health Congress in Hastings from Tuesday, 28th April to Friday, 1st May inclusive.

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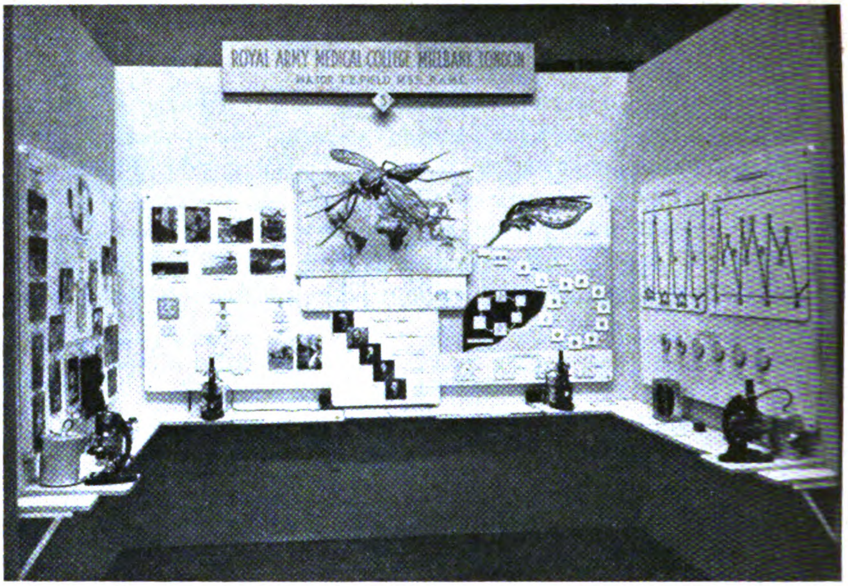

[*Photo: H. W. Harrington, Dublin*

SCIENTIFIC EXHIBITION—B.M.A./I.M.A. MEETING DUBLIN, JULY, 1952

This year, for the first time, a scientific exhibition was held at the joint B.M.A./I.M.A. Meeting in Dublin. An exhibit on malaria prepared by the R.A.M. College was shown at this exhibition, and was favourably reviewed. The exhibit demonstrated by means of maps, diagrams, photographs, specimens and drugs, the world incidence of malaria, the life cycle of the malarial parasite, and modern methods of prevention and treatment. In addition, the clinical and pathological aspects of malaria were briefly reviewed and demonstrated by charts and specimens. A small historical section was included, with exhibits of some interesting documents and pamphlets from the Muniment Room of the Royal Army Medical College, Millbank. Emphasis was laid on the preventive and suppressive aspects of malaria, with particular reference to the work done by the Royal Army Medical Corps in various parts of the world.

T. E. F.

MEDICAL GASES—COLOUR OF CYLINDERS

THE Medical Defence Union and the British Oxygen Co. Ltd., have drawn attention to the changes of colour of cylinders containing medical gases, which began on 1st August, 1952, with nitrous oxide, the colour for which is altered from black to French blue. Full details may be obtained from the British Standards Institute, 28 Victoria Street, London, S.W.1.

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Book Reviews

SURVEY OF CANCER IN LONDON. By Lieut.-Colonel W. L. Harnett, *C.I.E.*, M.D., F.R.C.S., I.M.S. (retd.). London: British Empire Cancer Campaign. 1952. Pp. vi+834. In cloth, 50s.; in paper cover, 45s.

This very comprehensive work deals mainly with the question of differential treatment of malignant diseases and its results. It provides accurate and valuable information in respect of the incidence, the natural history and the prognosis of cancer, affecting the various organs and tissues included in the investigation. For all who are interested in malignant disease this should be a most useful and reliable work of reference. The survey was limited to the London area and was carried out in 1938 and 1939, when it was brought to an end by war. Special case-sheets were completed for every case of cancer seen. By September, 1939, 15,201 cases were registered; 97.4 per cent. of these were followed up over five or more years from their date of registration. In this survey the figures are presented in great detail for each cancer site.

In the introduction Sir Heneage Ogilvie states: "The analysis here presented is something unique in scientific literature. Never has so large a series, entirely unselected, representing the results of research not by one expert, but by the staffs of many hospitals been collected. Never has an analysis so detailed, so carefully checked and so impartial, been presented."

R. A. S.

EXPERT COMMITTEE ON CHOLERA. 1st Report. World Health Organization: Technical Report Series, No. 52. Pp. 18. 1s. 3d.

This report gives information on a wide variety of problems and investigations in relation to cholera. Investigations include a comparative study of the results obtained with Bandi's test, and the classical techniques in the laboratory diagnosis of cholera; also research on the retrospective diagnosis of cholera through study of the agglutinin response following anticholera inoculation. An interesting study has also been made regarding the possible role of certain types of fish and other aquatic animals as sources of cholera infection. Considerable work is still required in this investigation, and both field and laboratory studies are to be carried out in the future.

Problems relating to the serology of the cholera vibrio, such as antigenic structure, mutations, etc., are briefly discussed, and recommendations for further studies made.

It is interesting to note that the Committee do not consider that convalescent and contact carriers play a significant part in the spread of cholera.

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This report, though somewhat brief, is stimulating and at times provocative. It is easily understood and contains a helpful annex of techniques of newer tests. It should be of considerable interest to those whose work includes investigation and diagnosis of cholera infections.

T. E. F.

THE STORY OF THE ADAPTATION SYNDROME. Hans Selye. Montreal, P.Q., Canada: Acta, Inc. 1952. Pp. 225. $4.50.

Professor Selye has compiled this book from "only slightly edited" wire-recordings of a series of seven lectures on his life's work. In the first five, he traces the development of the general adaptation syndrome from his early thoughts, as a medical student in 1925, on "the syndrome of just being sick" to current research. The sixth lecture is an objective account of the present position of the theory and its applications; the seventh combines summary with ideas for future development. Except for an omission on p. 129, the presentation is lucid and simple, and anyone who has thought the concept of stress and adaptation too difficult or too unreal will be agreeably surprised by reading Professor Selye's story in his own words.

Except that he provides a glossary, Professor Selye is a veritable Humpty-Dumpty in his use of words, and he declines to enter into discussion on the terms he has chosen. But he claims flexibility for both his theory and his attitude: would he agree that it is unnecessary to use both "hypokalæmia" and "hypopotassæmia," and that there is a better word than "target" to convey "that which responds to a stimulus"?

J. B. N.

HISTORY OF THE ROYAL MEDICAL SOCIETY, 1737-1937. By James Gray, M.D., F.R.S.E., edited by Douglas Guthrie, M.D., F.R.C.S.E. Edinburgh: The University Press. 1952. Pp. xi and 355. 42s.

Founded in 1737 in succession to an unofficial group which had been meeting since 1734, the oldest medical society in Britain maintains to this day its character as a vigorous association of students and young graduates. Its story, told with piety by Mr. Gray and ably edited by Dr. Guthrie, is that of the greatest names in the Edinburgh medical school, and therefore, for more than its first hundred years, of British medicine. The Army medical services can claim, in John Monro, the "godfather" of the Edinburgh medical faculty; in George Cleghorn and James Kennedy, two of the six members of the 1734 group; in James Douglas, the preserver of the society's earliest extant minute book; and notable names among the presidents up to the present time.

The book will interest, profit and delight many more than Edinburgh graduates, and its production reflects great credit upon the infant Edinburgh University Press.

J. B. N.

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PSYCHOLOGY: THE NURSE AND THE PATIENT. By Doris M. Odlum, M.A. (Oxon.), B.A. (Lond.), M.R.C.S., L.R.C.P., Dip. Ed. London: The "Nursing Mirror." 1952. Pp. 114. 7s. 6d.

The really good nurse has an intuitive understanding of the emotional needs and difficulties of the individual patient. This little book succeeds in explaining lucidly and briefly the psychological factors and mechanisms influencing the patient's behaviour and expression of his symptoms, distinguishes between the tough and the tender patient, and emphasizes the peculiar intimacies and significance of the patient—nurse relationship. Good nursing is infinitely more than the impersonal surveillance and efficient attendance on a patient undergoing routine medical therapy, and any girl who feels she has a vocation for nursing should read this book if she wishes to practise with understanding and humanity.

H. P.

LOGAN TURNER'S DISEASES OF THE NOSE, THROAT AND EAR. Edited by D. J. Guthrie. Bristol: John Wright & Sons. 1952. Pp. xvi+468. 42s.

It is with the greatest pleasure that one turns the pages of this long-awaited, new and re-written Logan Turner's Diseases of the Nose, Throat and Ear.

The fifth and latest edition carries on the torch in the direct line of succession to the traditions and teaching successively nurtured and expounded by Logan Turner, J. S. Fraser, and Ewart Martin.

It is second to none as a textbook for the aspirant to E.N.T. Surgery, being especially valuable in its clarity, conciseness and methodical approach. The illustrations, both old and new, are of an extremely high technical standard and a most valuable feature of this textbook which remains a living memorial to its earlier authors.

H. N. P.

BIBLIOGRAPHY OF THE PUBLISHED WRITINGS OF SIR ALMROTH E. WRIGHT, M.D., F.R.S. Compiled by Leonard Colebrook, F.R.S. London: William Heinemann, Medical Books, Ltd. 1952. Pp. 32. with one plate. 6s.

An annotated record of the publications of a great pathologist and teacher, which we who cherish his memory as Professor of Pathology in the Army Medical School from 1892 to 1903 are glad to welcome.

J. B. N.

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EDITORIAL NOTICES

Original articles, notes and letters bearing upon either the medical or the military aspect of the work of the Corps will be gladly received. All papers intended for publication should be typewritten (*not* duplicated), double-spaced and fully corrected. Proofs are not sent to authors serving out of the United Kingdom.

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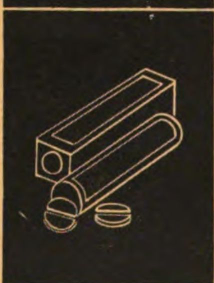

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Authors are alone responsible for the statements made and the opinions expressed in their papers.

Journal

of the

Royal Army Medical Corps

Original Communications

THE BIRTH OF THE BRITISH COMMONWEALTH DIVISION, KOREA

Extracts from a talk given by

Colonel G. ANDERTON, O.B.E.

A.D.M.S., 1 *British Commonwealth Division, in November*, 1951, *to Officers and Warrant Officers of the Medical Services, Land Forces, Hong Kong.*

GENTLEMEN.—Within a very short time after my arrival here the other day on leave, I was asked by Colonel MacFarlane, your A.D.M.S., if I would talk to you about my experiences in Korea during the last few months. I look upon this opportunity as a very great privilege and I can only hope that what I shall be able to tell you may be of use to those of you who may serve in the future with a formation engaged in active operations, whether your task be administrative or professional.

I noticed at once that the subject of my talk was described as "Casualty Evacuation in a Divisional Area." Were I to keep entirely to the confines of this title, I should have little to say, as casualty evacuation in the Commonwealth Division has followed closely the basic rules as laid down in our training pamphlets. I have therefore decided to try and give you a general picture of the inevitable teething troubles encountered during the formation of the Division in June and July last, with an account of the operational activities during its early stages in action.

During May last, while I was still in Hong Kong, I had met the Divisional Commander, Major-General A. J. H. Cassels, *C.B.*, *C.B.E.*, *D.S.O.*, and had received his verbal orders to be in Kure, Japan, not later than 10th June.

Travelling by R.A.F. plane, I arrived on that date in Kure, to be welcomed

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and accommodated by Colonel J. E. Snow, *O.B.E.*, Officer Commanding, 29 General Hospital, which, combined with B.C.O.F. (British Commonwealth Occupation Forces) General Hospital, received the sick and casualties from the Commonwealth Forces serving in Korea and Japan.

On the next day, Major-General Cassels held his first briefing conference attended by his C.R.A., his senior staff officers and heads of services. We were told the composition of the formations and units which would in due course be included in the Division, these formations and units coming from all parts of the British Commonwealth. We were told of his future plans; that Divisional Headquarters would assemble at Pusan, Korea, on 24th June and that he considered the Headquarters should be able to take over operational and administrative command of the forward formations and units by the end of July.

I remember so well his final words at the end of the conference: "Gentlemen, in the Army there is always a chance of getting a 'Bowler hat'. In this task you have before you, involving intimate liaison with members of all our Commonwealth brethren, and with members of many other countries in the United Nations, there are chances of getting at least seven such hats." With these words he sent us on our separate ways to visit the forward formations and units in Korea, to meet everybody we possibly could, and to get all possible information before we should all meet again in Pusan on 24th June.

In this matter I had an extremely lucky break which has proved to be of the utmost value since. Major-General F. K. Norris, *C.B.E.*, *D.S.O.*, *E.D.*, K.H.P., Director-General, Australian Army Medical Services, was then in Kure with the intention of visiting the Commonwealth Forces in Korea, accompanied by Colonel (now Brigadier) C. W. Nye, D.D.M.S. (Adm.), H.Q. British Commonwealth Forces in Korea (B.C.F.K.). I was invited to join this party, leaving on the following day, 12th June.

How lucky I was! I travelled on a "magic carpet" and, to cut a long story short, I was able in the next six days to visit and meet the people who mattered in all the Commonwealth formations and units (less two battalions which distances precluded in the time available), and also all United States formations and medical installations from the base to the forward areas.

At this point I must digress slightly and explain the administrative "set up." The three Independent Brigade Groups then existing, 25 Canadian Infantry Brigade, 28 British Commonwealth Infantry Brigade, and 29 British Infantry Brigade, were operationally under command of 8 (U.S.) Army and were fighting under a U.S. Corps or Division as circumstances made necessary. The administrative arrangements for these three brigade groups lay with the Main Administrative Headquarters, in Kure, with an advanced element at Taegu, Korea, to liaise with the Main Headquarters of 8 (U.S.) Army located in that town. The Medical Branch at B.C.F.K., Kure, consists of a D.D.M.S. and staff which, as with other branches, has a direct link with the War Office. In Kure is an Australian Advanced Depot of Medical Stores which receives its supplies from three separate sources, Australia, Canada, and Singapore (from U.K.).

The forward Commonwealth Forces at that time were already located north

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of Seoul and medical supply was carried out in the main by R.A.A.F. aircraft from Kure (Iwakuni airfield) to Seoul (Kimpo airfield).

I then spent from the 18th to 23rd June back in Kure co-ordinating my impressions and collecting all the information I could about the general administrative arrangements and the reports and returns, etc., which would be required by the Medical Branch, B.C.F.K., when the H.Q. Division took over command. On 24th June, I, with all my colleagues on the Divisional Headquarters, arrived at Seaforth Camp in Pusan ready to receive the remaining elements of the Headquarters disembarking the next day. All duly arrived, together with the Divisional Signal Regiment, the Field Engineer Regiment, and the remainder of the Divisional Column, R.A.S.C.

You will realize by now that as well as the actual formations and units coming from all parts of the Commonwealth, so must Divisional Headquarters be fully integrated at every level; and so it turned out. A Canadian G.S.O.1, a British A.A. & Q.M.G., a Canadian D.A.Q.M.G., a British D.A.A.G., Australians, New Zealanders, Indians, all are represented within the Headquarters and Service Branches.

I have not yet told you the medical units which were to come under my operational and administrative command. There were three field ambulances with a very strong rumour of a field dressing station to come from Canada at some future date. These three units, 25 Canadian Fd. Amb., 26 Fd. Amb., and 60 Indian Para. Fd. Amb., had all come out originally on a Brigade Group standard and all had some measure of surgical potential.

25 Canadian Fd. Amb. had arrived with 25 Canadian F.S.T. and 25 Canadian F.T.T. attached, but at the time of visiting in June, these two teams were working in a U.S. Mobile Army Surgical Hospital (M.A.S.H.), the equivalent of a U.K. Advanced Surgical Centre, in support of the U.S. Corps under which the Commonwealth Brigades were operating.

26 Fd. Amb. had come out originally with 22 F.S.T. and 9 F.T.T. attached. 22 F.S.T. had been detached for duty with B.C.O.F./29 General Hospital to implement the surgical potential there—9 F.T.T. was still with the field ambulance.

60 Indian Para. Fd. Amb. had arrived with its full establishment which, as you will all know, includes two surgical teams complete.

A rear element of this unit left in Taegu had opened a small M.R.S. to cater for the needs of Commonwealth personnel stationed there, and in addition one of the surgical teams was, and is still, doing most valuable work in the Korean Military and the Korean Civil Hospitals in that town.

In addition to these medical units, one must mention the M.A.C. and dental potential then available within these three Independent Brigade Groups. With 26 Fd. Amb. there were three sections of motor ambulances and one section of T.C.Vs., all belonging to 78 Coy., R.A.S.C., while with 25 Canadian Fd. Amb. there were two sections of motor ambulances of 38 M.A.C., R.C.A.S.C.—a total of thirty motor ambulances and six T.C.Vs. My dental potential consisted of the Dental Department, 26 Fd. Amb., 223 and 224 Mobile Dental Teams (U.K.),

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a Dental Department (less a dental technician) with 60 Indian Para. Fd. Amb., four dental detachments R.C.D.C., one each with the four major units in 25 Canadian Inf. Bde., and finally a Dental Section R.N.Z.D.C. attached to 16 Field Regiment, N.Z.R.A.

The following, and what seemed very few, days from 24th June to 14th July were days of extreme activity. The divers people from literally all parts of the Commonwealth had to get to know each other, learn to "speak the same language," learn each other's particular little different administrative problems and weld themselves into a team capable of taking operational and administrative control of the forward formations and units already fighting close on three hundred miles to the north.

Teething troubles were naturally many, and from our point of view the cutting of our "hygiene teeth" was by no means one of the least. By the aid of a loyal and hard-working medical staff, and by the hearty co-operation of commanders and staff, these troubles were soon surmounted. Medical Administrative Instructions, D.R.Os., etc., had to be drafted *de novo* for that magic day when "1 Comwel Div." should take over command—these instructions having to be worded in such a way as to fit in with the various Commonwealth countries in regard to their slight differences in administration, differently numbered Army Forms, differences in designations of certain units and teams, etc.

Divisional Headquarters, with the Divisional Signal Regiment, Divisional Column R.A.S.C., etc., had still to move some three hundred miles from Pusan to its battle location north of Seoul. At first, a move by sea from Pusan to Inchon (a port some twenty-eight miles from Seoul) had been considered, but the Divisional Commander in his wisdom decided we should move by road and educate ourselves thereby.

How right he proved to be—how raw we were—and how totally untrained for the line of march ! Over the period of 15th to 22nd July we moved by road from Pusan to Suwon, a small town some twenty miles south of Seoul. By the time we got to Suwon you can guess we were fairly good at moving, opening up at night, making ourselves reasonably comfortable in adverse surroundings and shutting up quickly in the morning. By then we had almost come to look upon ourselves as at any rate a partially trained team of soldiers.

On 26th July, after a two-day signal exercise, we moved forward to the battle locations for Divisional Headquarters—with main Divisional Headquarters some five miles behind Brigade Headquarters level—the forward defended localities being then just south of the River Imjin, about thirty-five to forty miles north of Seoul.

At midday on Saturday, 28th July, 1951, in the presence of General Van Fleet, the Commander of the 8th (U.S.) Army, and many other senior officers, the divisional flag was unfurled and the First British Commonwealth Division came into being.

It would now seem meet to describe the medical arrangements which existed when Divisional Headquarters took over control.

The F.D.Ls. in the divisional sectors were just south of the River Imjin,

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approximately forty miles due north of Seoul, the line of defence being called the Kansas Line. 28 Britcom Inf. Bde. and 29 Brit. Inf. Bde. were holding that line with 25 Canadian Inf. Bde. in reserve positions.

The geography of the country, the nature of the roads, and the shortage of lateral road communications had made it inevitable that all field ambulance A.D.Ss. had to be opened in support of their respective brigades. Any battle casualties and sick received at the A.D.Ss. were taken by M.A.C. motor ambulances to an American Mobile Hospital (8055 M.A.S.H.) some ten miles down the main supply route (M.S.R.) at Ui-Jong-Bu. The next stage in evacuation was by rail to 121 Evacuation Hospital (U.S.) near Seoul. Further evacuation was by Dakotas of the R.A.A.F. from Seoul (Kimpo airfield) to Kure (Iwakuni airfield), where casualties were admitted to B.C.O.F./29 General Hospital. The Kansas Line being of a holding and defensive nature only, the opportunity was taken of opening up all A.D.Ss. to hold limited numbers of minor sick and non-battle injuries up to a period of ten days. This was done with a view to avoiding the very gross wastage of manpower which was occurring by such cases being evacuated to Kure, with the inevitable time lag occurring over their return to their units.

Before the middle of June no air lift for casualties or sick existed from Seoul, and all cases went down south through the American channel by rail as far as Pusan, whence Commonwealth patients were air-lifted to Kure. With this procedure administrative difficulties arose, as Commonwealth patients inevitably arrived at many different American hospitals *en route* to and in Pusan.

To get the air lift from Seoul to Kure, instead of from Pusan, was a step which proved of inestimable value. Even so from time to time in periods of battle stress some Commonwealth patients do occasionally "slip through the mesh" at Seoul level, get into the main American evacuation channel, which again leads to these small but nevertheless troublesome administrative problems.

In this respect I can give one example of the commander of a certain Commonwealth unit who recently received a letter from one of his men written from California saying how much he was enjoying his convalescence in that State. The method by which that man will eventually get back to his unit in Korea is one which, to say the least of it, will provide food for thought. Admittedly this example is a somewhat extreme one, but it does emphasize the difficulties which may arise once a Commonwealth soldier gets outside his own accepted channels of administration.

During August, 1951, the main positions of the Division virtually did not alter. Operations mainly consisted of raids in force across the River Imjin ; the strength of the forces involved varying from one company to a brigade less a battalion, and the duration of the raids varying from twenty-four up to seventy-two hours. North of the river, roads were conspicuous by their absence and reliance had to be placed on stretcher-bearer carriage, or, in certain instances, the use of Oxford carriers, to evacuate lying sick and casualties to the north side of the ferries. In this respect it should be mentioned that the Oxford carrier, having a higher ground clearance and a more powerful engine than the Universal

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carrier, proved of the very greatest value in clearing casualties over the boggy paddy-field terrain found north of the river at that still very rainy period.

I have not as yet made any mention of evacuation by helicopter. This is controlled at U.S. Corps level, a certain number of machines being earmarked specially for evacuation purposes and a call being retained as necessary on helicopters belonging to the Air Rescue Squadron. (The latter machines are primarily intended for the rescue of aircraft pilots who may crash-land or parachute into enemy territory). This helicopter evacuation has worked extremely smoothly and efficiently. The helicopters used can carry two stretcher cases, one in each of two closed boxes made of a plastic material and suspended on each side of the machine. A call for a helicopter is made from battalion to brigade and then from brigade to division on a staff net ; passed over to the Medical Branch, which in turn calls the Surgeon's office at Corps, and literally within a few minutes a machine is in the air *en route* to the casualty. These aircraft naturally cannot fly into areas which are under small-arms or mortar fire, but otherwise, given good visibility within the hours of daylight, they can land practically anywhere. I cannot speak too highly of the value of helicopters in this particular type of hill warfare, and of the immense part they play in helping the morale of the troops committed to battle in knowing such facilities are available should they themselves be wounded.

During the second week in August, 25 Canadian F.D.S., up to full establishment, arrived in Seoul by road from Pusan, where the unit had landed earlier in the month. Quite a good school building—and one not very heavily damaged—had already been earmarked in Seoul, and it was considered large enough for 200 beds to be established and also allow adequate accommodation for the personnel of the unit.

Extra beds and other accommodation stores were procured and the unit opened with 100 equipped beds on 20th August, 1951—a most praiseworthy effort. By the end of the month the unit had expanded to its planned strength of 200 beds.

The opening of this unit greatly simplified my own task of trying to hold as many minor sick as possible within the divisional area, and the following holding policies and channels of evacuation were adopted at once. Field ambulances were to hold minor sick up to three days, and V.D. cases requiring in-patient treatment for a maximum of seven days. The F.D.S. was given a holding policy of fourteen days for minor sick and injuries, cases not likely to be fit for R.T.U. within that period being evacuated by R.A.A.F. aircraft direct to B.C.O.F./29 General Hospital, Kure. Later in this talk I shall be able to give you figures which will show what a valuable adjunct a F.D.S. can be in regard to saving unnecessary sick wastage out of the division.

In order to conserve transport it was found necessary to establish an "Amb-Car Staging Post" somewhere on the M.S.R. at a point where all A.D.Ss. could send such minor sick as they were unable to hold for onward evacuation to 25 Canadian F.D.S.

A detachment from the field ambulance in reserve was detailed for this

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task, and was established on the M.S.R. just below the junction of the southernmost brigade axis with the divisional M.S.R. Sick from the forward A.D.Ss. drained into this post and were sent down to the F.D.S. in the motor ambulances of a reserve section M.A.C. held at the detachment location.

Came September, and with it, commencing on the 11th, an operation designed to secure positions on the north side of the River Imjin. The line to be taken and occupied was called "Wyoming" and the operation meant an advance of some three to five miles forward of our present Kansas positions.

The A.D.Ss. of the brigades taking part in the attack were moved forward to just south of the river, sections of companies of field ambulances were placed in support of their respective brigades and, in fact, the normally accepted plan of evacuation was followed. Battle casualties were evacuated to a Norwegian unit, the Norwegian Mobile Surgical Hospital (NORMASH), which is equipped —and has the same establishment—as an ordinary U.S. Mobile Army Surgical Hospital. This unit was then located some way down the divisional M.S.R., and it took some one and a half to three hours for a motor ambulance to get there from our A.D.Ss., depending on the locations of the A.D.Ss. and the severity of the casualty. No major difficulties arose in this operation, which was most successful, and, from looking at my figures for September, I see we evacuated only some 79 casualties over the whole month.

By the end of September the ferries across the River Imjin had been replaced by one-way pontoon bridges, the level of the river had dropped considerably owing to the greatly decreased rainfall, and in certain places the river was fordable with ease by tanks.

These pontoon bridges were given names from east to west as follows: White Front (in use by 1 U.S. Cavalry Division), Pintail and Teal—the two latter taking the M.S.Rs. for our right and left brigades respectively. In addition some two miles above White Front bridge (the River Imjin running from north to south in this area) was a pontoon ferry called Whistler.

The latter end of this month saw planning begun for an operation (Commando) to take place early in October, and designed to advance distances from three to five miles from our then "Wyoming" line. The operation entailed regrouping with a shift to the east, taking over a position from 1 U.S. Cavalry Division on our right. The actual movement forward was to consist basically of a pivot on our left flank—the final line—called "Jamestown," then to be running approximately from north-east to south-west.

28 Britcom Inf. Bde. on the right with one battalion 29 Brit. Inf. Bde. under command and 25 Canadian Inf. Bde. on the left were to carry out the attack. 29 Brit. Inf. Bde. less one battalion were to be in reserve.

Regrouping as above was carried out, 28 Britcom Inf. Bde., 25 Canadian Inf. Bde., and 29 Brit. Inf. Bde. then using White Front, Pintail and Teal bridges respectively. A.D.Ss. for the attack were sited as follows: 60 Indian Fd. Amb. some two miles north of White Front bridge on the east bank of the River Imjin, and to use Whistler ferry, which was manned on a 24-hour service: 25 Canadian Fd. Amb. on the south bank of the River Imjin just below Pintail bridge; while

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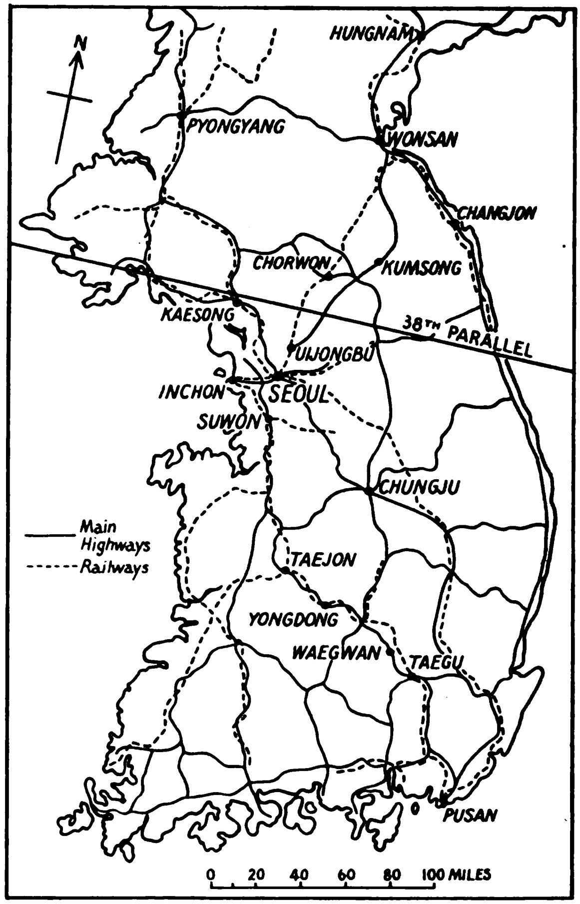
26 Fd. Amb., in support of the reserve brigade, was sited south of Teal bridge. Plans were made by Os.C. Fd. Ambs. for C.C.Ps. to be established in support of the brigades as, when, and where necessary. The Surgeon, 8 U.S. Army, after discussion with the Surgeon, 1 U.S. Corps, and myself, agreed to move the Norwegian Mobile Surgical Hospital (NORMASH) some thirteen miles for-



SOUTH KOREA SHOWING MAIN TOWNS, ROADS AND RAILWAYS

ward up the Corps M.S.R. to a road junction where casualties could be drained from the brigade M.S.Rs. This move was carried out on 2nd October, 1951 (D—1), and, as turned out later, proved an invaluable step, saving at least one and a half hours' travelling time for the casualties and a resulting saving on the "turn round" of motor ambulances of approximately three to four hours. To use 25 Canadian F.S.T. and 25 Canadian F.T.T. to full advantage, these were attached to the NORMASH to increase the surgical potential there.

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The attack was put in on 3rd October, 1951, and the major fighting continued until about 8th October, to die down to sporadic patrol encounters by 12th October.

Casualties for operation "Commando" totalled some 400 killed and wounded, of which just over 60 were killed. Unfortunately amongst those killed was Capt. Beith, R.A.M.C., the R.M.O. to 8 Hussars, who was known to many of you when he served in Hong Kong in 1949/50. He was killed by mortar fire at his R.A.P., then sited close by the C.C.P. of 60 Indian Fd. Amb.

Evacuation proceeded smoothly throughout the operation and I note from my figures that some 327 wounded passed through the divisional A.D.Ss. over the period 3rd to 11th October ; and in addition 13 are recorded as having been evacuated by helicopter direct from the forward areas to the NORMASH.

In the northernmost part of our sector a few casualties (from 3 Royal Australian Regiment) could not be evacuated through the normal field ambulance channels owing to geographical difficulties and enemy fire. These were carried by Centurion tanks of 8 Hussars, which forded the River Imjin on our right flank and took them to an American clearing station in 1 U.S. Cavalry Division sector.

I should estimate that the approximate time taken for a lying casualty to travel from F.D.Ls. to the A.D.S. was from one and a half to three hours and from A.D.Ss. to forward surgery at the NORMASH was about the same. Considering the nature of the country and the poor roads these timings cannot be considered excessive.

I will now say a few words about the battle casualties, and also sickness in general. I have complete figures for August and September, those for October, as I left Korea on leave before the end of that month, not being finally available.

Battle Casualties.—As I said before, we evacuated 29 and 79 battle casualties in August and September respectively, of which a large proportion were battle accidents.

It is interesting to classify for September the types of missile causing these 79 casualties : G.S.W., 28 ; mortar, 16 ; grenade, 6 ; mine, 5 ; battle accidents, 24.

Sick.—With the figures to follow I want to emphasize the comparatively low rate of sickness and conversely the high proportion of those which we have been able to hold within the Division. The figures given will therefore be for admissions to divisional medical units and average numbers held within, and numbers R.T.U. from, those units.

	August	*September*
Admissions to div. med. units (excl. V.D. patients duly recorded *but treated entirely as out-patients*) (per 1,000 per day)	2.78	2.44
Average number held daily within div. med. units	183*	213†
Total admissions to div. med. units	1,425	1,448
Total R.T.U. from div. med. units	389 (27.3%)	959 (66.2%)

* Fd. Ambs. 70, F.D.S. 113. † Fd. Ambs. 62, F.D.S. 151.

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It should be remembered that the F.D.S. did not open until 20th August, 1951, and it will be seen from the figures for September that with all the divisional medical potential available it was possible to hold within the divisional area and return direct to their units over 60 per cent. of the total admissions for sickness or non-battle injuries.

In concluding this talk, there are a few general points which I should like to bring forward.

I want to emphasize the importance of the ordinary day-to-day work in a field medical unit. It is not the battle casualties which cause the major problems—these casualties occur sporadically in small numbers all the time during periods of battle contact, with occasional intense waves of activity, when every man and every vehicle is employed to the full. Sick are with us all the time and, unless battle conditions are desperate, always greatly outnumber the battle casualties over any given period. Inoculations, vaccinations, hygiene inspections, V.D. surveillance for the various echelons and also for units without R.M.Os., all take up the time of medical officers in field medical units—these no mean tasks in themselves. How often do non-medical people think of a field ambulance as only caring for and evacuating the wounded? I want you to ponder on this and realize the hundred and one tasks which fall on the lot of a field ambulance or F.D.S.

I want those of you who are R.M.Os. to realize the importance of the routine sick returns which you are expected to render to your A.D.M.S. or S.M.O.—to realize that they are of value, not just to him, but also to the commander of the division or brigade concerned, who is naturally vastly interested in the state of health, and therefore fitness for battle, of his troops. Ponder on this point, too—so often I found M.Os. look upon them as a rather unnecessary evil and meant only to satisfy the demands of statisticians. Far from it—they are valuable in the extreme, when an A.D.M.S. is striving to help his Divisional Commander to save manpower.

Remember also that the place of the R.M.O. is at his R.A.P. where all can find him—not "swanning" around the battlefield looking for and treating casualties. An old lesson, but one which bears repetition.

I have spoken before of the value of Oxford carriers for evacuation of wounded—the main disadvantage being that the casualties have to be carried on top of the vehicle and are thus exposed to enemy action.

The Universal (Bren) carrier lends itself to a very simple modification, by which two stretchers can be carried inside the armour and the casualties protected from small-arms fire. The job can be done by any Divisional R.E.M.E. Workshop and consists of cutting off the back plate, extending the armoured sides some eighteen inches and using the original back plate as a hinged rear door. The fitting of suitable runners (to take both U.K. and U.S.A. pattern stretchers), and a canopy, presents no difficulties, and the completed product is indeed an armoured ambulance car with a very good cross-country performance providing a comfortable ride for the casualties. Several such carriers have been modified within the Division and have already proved their worth in battle.

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Owing to the main supply route for medical stores being by air from Iwakuni (Kure) to Kimpo (Seoul), it was decided that a considerable reserve should be held within the Division, in case any break in the supply chain should arise. All divisional medical units hold fourteen days' reserve, in addition to their normal monthly maintenance supplies, and at the F.D.S. in Seoul we hold a reserve of essential battle supplies, on an estimated scale of six days' intensive fighting for six battalions. With regard to extra stretchers and blankets, each field ambulance holds 50 and 150 respectively over and above their brigade requirements and their own G.1098 scale, while a "dump" of 500 stretchers and 1,500 blankets is held at the F.D.S. from which issues are made only on the authority of the A.D.M.S.

The coming cold weather has made us do a lot of planning. Full-scale modern winter clothing is on its way, courses in the prevention of cold injuries are to be run, both for all units in the Division and also for medical officers. Early indoctrination of all members of the Division—with emphasis laid on the responsibility of the junior leaders and of the men themselves in combating cold injuries—we feel should lead to minimal loss of manpower by these causes.

Plans have been made to winterize all stretcher-jeeps, and to provide efficient means of heating both these and all the motor ambulances within the Division.

Windproof bags (both U.S.A. and Swedish pattern) for stretcher casualties have been indented for and, as far as would seem possible, all steps have now been taken to ensure that battle casualties do not suffer unduly from the effects of cold during evacuation.

It is almost needless to say how interesting my task has been and still is. After all, one has been dealing with the many members of the Commonwealth nations, all of whom naturally have a slightly different outlook on so many things, have different methods of administration, etc., but who all in the end reach the same target. A composite team has been formed and I have no hesitation in saying that all members are working happily together with the greatest pride in their being part of that great experiment in integration—the Commonwealth Division. In addition our superior commanders, and many of the supporting arms and services, are American and a hearty, happy liaison must be, and has been, maintained with them at all times.

How easy it is to criticize those whose line of thought is not exactly the same as ours, belonging as we do to what has always been considered a somewhat reserved and insular race! No such criticism could ever be levelled at our American cousins. Never have I experienced more kindly co-operation, more helpful advice, and more generosity in helping us out over any difficult patches, than I have from them. As an example I can recall one particular instance when, being temporarily short of blankets for my F.D.S., I approached the Surgeon, 8 U.S. Army, to see what he could do to help me. I found that owing to large numbers of casualties having to be dealt with he was equally short—and the numbers in his "dump" could be counted in hundreds and not in the thousands as normally held. I was readily given a loan of some blankets, and I may say

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that the number I was lent totalled nearly half of all he himself had at the time. Can I say more?

This spirit I have found prevails throughout the American formations and units with which I have been associated.

I have wandered far from the originally declared title of my talk—"Casualty Evacuation in the First Commonwealth Division." I have instead done my best to give you a broad outline of the special problems involved in welding together three Independent Brigades, which included amongst them components from all parts of the Commonwealth, into one composite happy fighting team—the British Commonwealth Division—an integral part of the 8th U.S. Army. The team by now has been engaged in one major and several minor battles, has won them, and in consequence all members have their tails well up.

I have tried to paint you a composite picture of the build-up of the Division and of the method of functioning that has been adopted. Many things have been left unsaid, but time forbids mention of more. I am most grateful to your A.D.M.S. for giving me the pleasure and privilege of meeting you and talking to you all. I can only hope that what I have said may be of some interest to you and may possibly prove useful to you in the future.

My grateful acknowledgments are made to Major-General A. J. H. Cassels, *C.B.*, *C.B.E.*, *D.S.O.*, General Officer Commanding, First British Commonwealth Division, and Brigadier C. W. Nye, Deputy Director of Medical Services, British Commonwealth Forces in Korea, for permission to submit this article for publication, and also to Colonel J. B. Macfarlane, Assistant Director of Medical Services, Land Forces Hong Kong, for originally making it possible that the article should ever be written.

EDITOR'S NOTES

(*a*) Owing to lack of space this article has had to be condensed. The main points brought out by the author have, however, been included.

(*b*) The talk was given in November, 1951, and the author has since informed me of certain statistical points which are of interest.

Over the period November 1951 to February 1952 the over-all sick rate in the Division fell even more. The average admission rate over that period of sick and non-battle injuries to divisional medical units (excluding V.D. patients duly recorded but treated entirely as out-patients) was only 1.53 per 1,000 per day.

Of these admissions the proportion returned direct to their units without leaving the divisional area still remained at over 60 per cent.

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

V.—CULTURAL ABNORMALITY AND VARIATION IN ISOLATED STRAINS

BY

Colonel G. T. L. ARCHER

THE second paper in this series (Archer *et al.*, 1952) classified Egyptian urinary enteric carriers as chronic persistent, intermittent and transient. It was also shown that agglutinins for the flagella of the carried species are very commonly passed in the urine of chronic persistent carriers and that there is a high positive correlation between chronic carriage and urinary schistosomiasis.

During investigations made on strains isolated from urine then and subsequently, it was noticed that atypical reactions in culture and in serological

TABLE I.—CULTURAL AND SEROLOGICAL ABNORMALITY IN ENTERIC STRAINS ISOLATED FROM URINE

Species	Number of Strains	Number of Strains showing Abnormality						Number of Typical Strains
		Anaerogenesis	Dwarf Growth	Absence of Flagellar Antigen (smooth)	Roughness: Total	Roughness: Flagellar Antigen Present	Roughness: Flagellar Antigen Absent	
Salm. typhi	18		1	4	9	4	5	5 (*c*)
Salm. paratyphi A	30	12 (*a*)	1	6	9	3	? (*b*)	8 (*c*)
Salm. paratyphi C	10	1		3	2	1	1	4

NOTES.—(*a*) Includes 8 anaerogenic on first isolation.

(*b*) Degree of roughness made direct serological tests impossible at times. Manœuvres to produce smooth growth were often accompanied by those to induce motility. Direct observation for motility was not usually made.

(*c*) Including one *Salm. typhi* and two *Salm. paratyphi A* not completely tested.

tests were common. Abnormalities observed among 58 strains are recorded in Table I, which shows that only 14-17 of these strains exhibited none. Of the apparently typical strains only three were isolated on more than one occasion and were thus available for repeated study.

In many cases the abnormality appeared as a "tendency" (or temporary

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adaptation, rather than in a dominant variant or persistent mutant) in that it ceased spontaneously, or did not tend to recur. Occasionally, however, it was difficult or impossible to establish normal behaviour.

Such atypical reactions, especially if more than one are exhibited by a single strain, may lead to difficulties in identification and isolation.

The cultural abnormalities in gas production and colony size are considered in detail below.

Antigenic defects and the loss of virulence associated with roughness will be the subject of a further paper.

Strain numbers which are the same as excretor numbers in the second and fourth papers (Archer and Naylor, 1952) in this series refer to the strain isolated from the identically numbered excretor.

Anaerogenic Cultures

Hayes and Freeman (1945) refer to the description in the literature of anaerogenic variants of *Salm. paratyphi A*, *Salm. paratyphi B*, *Salm. paratyphi C*, *Salm. enteriditis* and *Salm. typhi murium*. In their own series of 548 strains of salmonellæ which are normally gas-producing, one anaerogenic strain of *Salm. paratyphi A*, one of *Salm. enteriditis* and three of *Salm. dublin* occurred. In addition, three strains of *Salm. paratyphi A* were anaerogenic in peptone water sugars but produced gas from the same carbohydrate in nutrient broth.

The present series contained a strain of *Salm. paratyphi C* which constantly failed to produce gas in glucose or mannite ; while it was under observation, gas production in dulcite also ceased. Twelve strains of *Salm. paratyphi A* showed irregular failure in gas production. Details of tests on the *para C* strain and on seven *para A* strains, including the absence of gas in some primary cultures in MacConkey-mannite (Archer and Ritchie, 1950), are shown in Table II.

Subcultures from single strains into separate sets of sugars gave varying results. Certain types of rubber washer used in bijou bottles may inhibit gas formation (McCartney, 1948). Much of the work on this series of strains was carried out in bijou bottles before these were replaced by test tubes as containers for sugar media. It therefore seemed desirable to re-examine in the latter containers. Dorset egg cultures of the strains described in Table II were available and were re-examined.

Re-examination

Salm. paratyphi C No. 35 : Gas production did not occur on re-testing in glucose and mannite. Thirty colonies from a plate subculture from glucose were also anaerogenic.

Salm. paratyphi A: All but two strains (Nos. 51 and 55) now showed normal powers of gas production, and two strains (Nos. 19 and 21) tested by culture of thirty colonies of each in glucose and mannite bred true as gas producers.

Strain No. 51.—Gas in normal amount was now regularly produced in mannite, but was absent once from glucose (in the first of twenty tests). This anaero-

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genic culture in glucose did not breed true, however, and two passages from plates to glucose fully established gas production in that sugar.

Strain No. 55.—On first re-testing strain No. 55, gas was produced in mannite in normal degree and was present, though in small quantity, in glucose. Plating

TABLE II.—ANAEROGENIC CULTURES

Strain	Number of Separate Isolations on which Fermentation Tests were made	Number of Times Anaerogenic	Detail
Salm. paratyphi C No. 35	1	1	No gas in MacConkey-mannite culture. No gas in glucose or mannite after 12 days. Dulcite was not fermented in 24 hours, but slight gas was produced in 48 hours.
Salm. paratyphi A No. 9	12	2	No gas on first isolation; later no gas in MacConkey-mannite; subculture from this produced gas in glucose but not in mannite.
Salm. paratyphi A No. 18	14	2	Gas on first isolation; later no gas in subcultures to glucose and mannite from colonies after direct plating, selenite, or MacConkey-mannite—though the latter itself contained gas: another culture showed no gas in glucose or mannite after 12 days; acid was produced in dulcite on the 5th and gas on the 12th day.
Salm. paratyphi A No. 19	6	2	No gas on first isolation or in a later culture from selenite.
Salm. paratyphi A No. 21	14	3	No gas on first isolation or once later; a third culture showed gas in mannite but none in glucose after 5 days.
Salm. paratyphi A No. 51	1	1	No gas after 48 hours, slight gas after 5 days.
Salm. paratyphi A No. 52	1	1	No gas in mannite or dulcite after 12 days, gas in glucose after 48 (but not 24) hours.
Salm. paratyphi A No. 55	1	1	Two sets of sugars: one showed gas, the other no gas.

and picking colonies, however, finally led to the isolation of an apparently stable mutant which was anaerogenic in both. It is a matter of interest that, in seven of the thirty tests, evolution of gas was delayed in mannite and normal in glucose media which had been inoculated in pairs with thirty colonies, since the colonies were picked from a plate from a glucose culture in which only a little gas was present, while its mannite counterpart showed normal gas. If G represents

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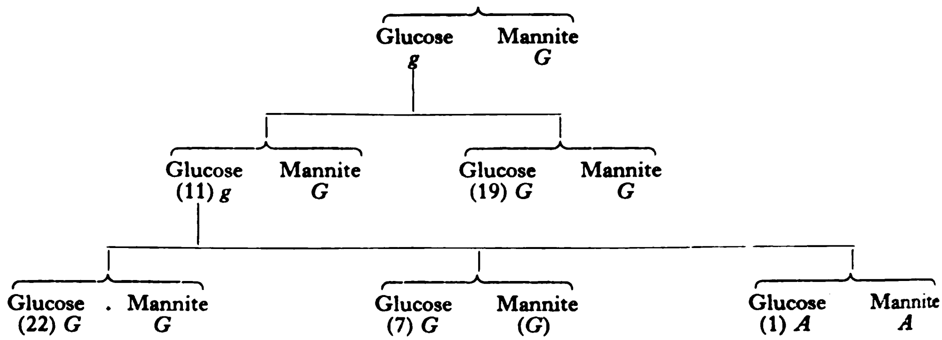
normal gas production, *g* a small quantity, (*G*) delayed production, *A* acid only, and the frequency of tests and findings is shown by a numeral in a bracket, results may be shown as follows :



A further point of interest is that while the mutant isolated was anaerogenic in glucose and mannite, it produced gas in dulcite at the same time as acid (after 48 hours). Colonies from plates inoculated from this dulcite, however, still failed to produce gas in glucose or mannite, but again produced gas in dulcite in all tests, though fermentation was further retarded and gas production sometimes lagged behind that of acidity, the former being delayed up to the eleventh day.

It thus appears that it is unnecessary to invoke the effect of rubber to explain the irregular gas production noticed earlier. It seems more likely that all anomalies were examples of a transient inability to complete the fermentation of certain "sugars."

Discussion

These findings suggest that an anaerogenic tendency is relatively common, but the production of anaerogenic mutants rare.

The "tendency"—and delay in complete fermentation—may be due to dominant anaerogenic *variants* with the production of sufficient recessive aerogenic organisms to produce visible gas late or on subculture.

Failure to produce gas in a number of sugars could arise from the lack of a single enzyme having a common intermediate product as its substrate, or from a multiple enzyme loss. In the former case the occurrence of gas in one or other of the sugar cultures might be due to the random presence, in those cultures in which gas is found, of an effective recessive aerogenic population. The distribution of such gas-containing cultures noted, however, was not such as should arise from chance, and the consistent absence of gas in glucose and mannite inoculated from colonies obtained by plating cultures in dulcite medium in which gas has been produced would seem to indicate that more than one enzyme is lost to bring about a general failure in gas production during fermentation reactions.

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Death in Culture

In the course of daily plating from sugars early death in culture was frequently detected. This might be due to acidity alone, to the production of toxic by-products of bacterial metabolism, or might be a combined effect of both.

Prolonged follow-up was largely confined to anaerogenic cultures, hence it was thought that the loss of ability to produce gas by species normally able to do so might lead to an increase of acidity beyond the limit of tolerance by such species, or to the undue accumulation of toxic substances ; on the other hand, early death in gas-containing cultures was also noted on occasions. Survival of the mutant of strain No. 55 in dulcite (in which gas was produced) was much longer than in glucose or mannite (fermented without gas) ; on the other hand, dulcite was a 0.5 per cent., glucose and mannite 1.0 per cent., solution.

A phenomenon suggesting acquirement of tolerance, followed by resumed growth, was occasionally noted, strain No. 55 cultures in dulcite which were apparently dead yielding positive subcultures later.

To investigate this matter the following experiments were made :

Experiment I

Strains used: *S. paratyphi A* (anaerogenic derivative of strain No. 55)
S. paratyphi A, HA 6
S. paratyphi C (strain No. 35 (anaerogenic))
S. paratyphi C (aerogenic strain)

Method: 1 per cent. glucose, mannite and dulcite, and 0.5 per cent. dulcite, in phenol red peptone water were distributed in large tubes, each containing a Durham tube, and inoculated with each of the four test strains. On 1st-5th days and on the 7th day after inoculation the existence and type of fermentation was noted, a loop from each culture was plated and a sample of each removed for *p*H determination by the quinhydrone method. The *p*H of the media before inoculation were 7.57, 7.86, 7.47 and 7.70 respectively.

Results:

1. *Survival and gas production:*

In glucose aerogenic cultures were dead on the 3rd day ; anaerogenic *Salm. paratyphi A* on the 4th, and anaerogenic *Salm. paratyphi C* on 5th day.

In mannite both *Salm. paratyphi A* subcultures showed diminished viability on the 3rd day ; the anaerogenic one was dead on the 4th.

In dulcite there was no effect on viability of any strain by the 7th day.

Both aerogenic strains produced gas in normal quantity in all media after 24 hours. Anaerogenic *Salm. paratyphi C* produced no gas in any medium by the 7th day. Anaerogenic *Salm. paratyphi A* produced no gas in glucose or mannite throughout. Normal gas was present in dulcite after 48 hours.

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2. *Survival and pH:*

Glucose: 3rd day—All of 8 cultures were more acid than *p*H 4.85. Six were more acid than *p*H 4.8 ; 5 of these were dead, one other at *p*H 4.8 was dead, subcultures of the remaining 2 showed a reduction in viable bacteria.

4th day—7 of 8 were more acid than *p*H 4.8 ; 6 cultures were already dead (see above), the survivor of acidity beyond *p*H 4.8 on the previous day was now dead also and the only living culture had now passed that degree of acidity. Only one colony grew from the inoculum when it was subcultured. It was sterile next day.

Mannite: 3rd day—5 of 8 cultures were more acid than *p*H 4.85 ; 3 were more acid than *p*H 4.8 ; 7 cultures were alive, one (at *p*H 4.86) was dead.

4th day—4 of 8 more acid than *p*H 4.85 (including a second dead culture at *p*H 4.63). Six cultures were alive.

Dulcite: (0.5% and 1.0%) 3rd day—1 of 16 more acid than *p*H 4.85 : all normal survival.

4th day—None more acid than *p*H 4.85 : all normal survival.

Revivals.—Apparent diminution of the surviving bacterial population, followed by an increase rather than a further fall, was noted twice in mannite. The diminution noted was never so marked as to suggest total death of the culture in these instances.

Most acid reaction in living cultures:

*p*H 4.55 in a dulcite culture of *Salm. paratyphi C*
*p*H 4.63 in glucose, mannite and dulcite cultures of *Salm. paratyphi A*

Least acid reaction at which a culture died:

*p*H 4.86 (*Salm. paratyphi A* in mannite)
*p*H 4.63 (*Salm. paratyphi C* in glucose)

Experiment II

Dead cultures of both aerogenic and anaerogenic *Salm. paratyphi A* in acid tubes from Experiment I were readjusted to neutral with NaOH. These were then tubed off in known volume and re-inoculated with known numbers of viable *Salm. paratyphi A* or of a coliform organism. Inoculated tubes were incubated or refrigerated. The former all grew with acid production. The latter showed no evidence of reduced bacterial population on subculture to plates.

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Conclusions

(i) The death of aerogenic salmonella species in sugar media is unrelated to loss of ability to produce gas.

(ii) Their death in such media is closely related to the acidity produced. *Salm. paratyphi C* seems slightly more resistant to acid than *Salm. paratyphi A*.

In general the limit of acid tolerance of the two species studied seems to lie in the region of *p*H 4.8–4.85.

(iii) No toxic metabolite other than acidity is produced by anaerogenic (incomplete) fermentation by *Salm. paratyphi A*.

(iv) Death of such cultures is not associated with impoverishment of the medium, which is still capable of supporting bacterial multiplication after readjustment of the acidity and which contains unfermented carbohydrate.

The second of these conclusions suggests that acid intolerance may explain (*a*) the irregular behaviour of cultures in enrichment media reported in the first paper in this series (Archer and Ritchie, 1950); (*b*) the sterile fluid cultures referred to in the second of these papers (and there suggested as due to phage action) and possibly even (*c*) intermittency of excretion; these being due on this hypothesis to an excessively acid bladder urine. Intermittent rather than transient carriage would arise where there was an infected focus from which reinfection of the urine could occur when less acid.

Small-colony (Dwarf) Strains

Morris, Sellers and Brown (1941) report the isolation from 10 persons of a small-colony strain of *Salm. typhi*. Colonies were smooth, but only 0.2 mm. in diameter on agar after 24-48 hrs. Colonies of normal size grew, however, if sodium sulphite or thiosulphate, flowers of sulphur, cystine or cystein (but not ammonium, magnesium or ferrous ammonium sulphate, tryptophane, lysine or tyrosine) were added to the medium. The late development of a large colony led to an increase in size of neighbouring small ones. Pathogenicity for mice, and biochemical and serological reactions, were normal.

Variants of a similar nature to these dwarf strains were produced by *Salm. typhi* strain No. 20 and *Salm. paratyphi A* strain No. 55 in the present series; they are described below.

Salm. typhi No. 20.—In December, 1949, three months after urinary excretion was detected in the carrier, large (L) and dwarf (D) colonies were seen on plating a specimen of urine.

Both types were agglutinated by *Salm. typhi* "O" serum, both were non-motile forms which failed to spread in soft agar (Colquhoun and Kirkpatrick, 1932), and both gave the biochemical reactions of *Salm. typhi*.

The D form showed only slight growth on agar and is apparently suppressed completely if the agar content of the medium is raised to 6 per cent., though

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growth of the L form was only slightly retarded thereby. There was at first no visible growth on litmus lactose agar ; minute colonies developed later. The D form was recovered from tetrathionate broth and from selenite medium after six hours. It grew more slowly than the L form in incubated urine.

Incidence in Urine.—The proportion of L to D colonies was determined on various occasions by plating serial dilutions of fresh urine on to a medium suitable for type differentiation (see below). Findings on examinations carried out over a period of eleven months were as follows :

Date	3/1/50	26/1/50	2/2/50	8/2/50	12/4/50	26/4/50	10/5/50	23/12/50
L/D ratio	19/12	19/28	14/15	62/12	33/147	14/64	72/178	115/20

Effect of Thiosulphate in Media

Experiments were made to observe the effect of the addition of sodium thiosulphate to media on the growth of this D form.

EXPERIMENT I

Media: Papain digest agar, tryptic digest agar, Lemco agar and litmus lactose agar were all used, plain, and with the addition of 0.2 per cent. and of 0.5 per cent. thiosulphate to each.

Inoculum: L and D forms of *Salm. typhi* No. 20.

Cultures were observed daily for three days.

Results

L form growth: 24 hours—colonies of average size on all digest media.

48 hours—average colonies on Lemco and L.L.A. ; large colonies on digest media.
No effect produced by thiosulphate on growth on any medium.

D form growth: 24 hours—The *only* media on which growth of the D variant was equal to that of the L form in the same time were papain agar to which 0.2 per cent. or 0.5 per cent. thiosulphate had been added.

72 hours—Growth of the D variant was now also equal to that of the L form of the same age on tryptic agar containing thiosulphate.
D form growth on Lemco was enhanced by thiosulphate but did not equal that of the L form on the same medium.
As regards L.L.A., the amount of thiosulphate added in this experiment, appeared to *worsen* D growth.

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Subculture of large colonies which had been produced by inoculating the D form on thiosulphate media reverted to characteristic D form growth on media not containing thiosulphate.

EXPERIMENT II

Growth of L and D forms was tested on plain MacConkey and MacConkey containing 0.5 per cent. and 1.0 per cent. thiosulphate, on L.L.A. and Lemco agar containing 1.0 per cent. thiosulphate, on D.C.A. (0.77 per cent. thiosulphate) and on Wilson and Blair medium.

Results

0.5 per cent. thiosulphate produced some enhancement of D growth on MacConkey.

1.0 per cent. thiosulphate in MacConkey, L.L.A. and Lemco agar produced colonies from the D form comparable to those of the L form (though they took longer to reach the same size). D.C.A. showed no differentiation between L and D. The D variant would not grow on Wilson and Blair medium in spite of its sulphite content.

Recognition

It is not always possible to recognize L or D forms by first appearances. A scanty growth of colonies from a heavy D inoculum on plain media may suggest a variation to the L form which is later disproved by characteristic D growth on subculture. Conversely the presence of very small colonies among others of normal size on urine plates was taken to indicate mixed L and D growths. These small colonies, however, behaved as L form on subculture, and true D form colonies appeared as *minute* colonies on the same plate after further incubation. D colonies were rather commonly rough, but the strain in general tended towards roughness.

Absence of Satellitism

No enhancement of growth of D form inocula in the neighbourhood of L form inocula took place.

Variation in vitro

L Form: The L form appears to be very stable. Repeated examinations and subcultures yielded only one colony the L→D variation of which could be proven by growth tests on suitable media, and identity tests in sugars and with T "O" serum. This D variant occurred as a single colony on one of two plates inoculated from outgrowths or papillæ noted after four days on a few colonies of the L form. Other suspect small colonies did not breed true as D ; others again died out in culture before confirmation of identity, or failed to be agglutinated by T "O" serum.

D Form: D→L variation, on the contrary, was quite frequently noted,

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rendering necessary a test of purity for D suspensions required for virulence tests, etc. Some colonies varying D→L showed papillæ or outgrowths suggesting, in view of the result noted above, that the colonies were mixed L and D. This could not be proved, however, as all subcultures from such outgrowths yielded growths of the L type.

The apparent greater stability of the L form may be fallacious. Development of a large from a small colony is at once obvious. The reverse will very generally be masked by growth of the parent colony. The persistence of the slower growing D form *in vivo* suggests its relative dominance.

Virulence of D form

This was twice tested in mice. It was very low, but so was that of the L form of this strain.

Salm. paratyphi A No. 55

This strain has already been shown to have yielded an apparently stable anaerogenic mutant. In the course of re-examining the stock culture on Dorset egg from which that mutant was derived, minute colonies accompanied by three large ones were observed in a subculture on MacConkey from glucose peptone water.

Minute colonies were observed later in purity tests of suspensions. Four were tested on different media in parallel with four cultures of *Salm. paratyphi A*, strain HA6.

The larger size of colonies of the latter strain was very marked on nutrient agar and definite on MacConkey. Thiosulphate enhancement of strain No. 55 D growth to equal that of HA6 in 48 hours occurred on nutrient agar. Growth of strain No. 55 D on DCA was, however, not equal to that of HA6, but was as poor as on MacConkey.

With this strain, also, some larger colonies were produced even on thiosulphate-deficient media, suggesting either D→L variation or contamination. Subcultures of such colonies, however, behaved as D on media with and without added thiosulphate, and identity as anaerogenic *Salm. paratyphi A* was confirmed biochemically and serologically. These scanty larger colonies accompanying characteristic D growth on media without thiosulphate showed marked colonial roughness.

Summary and Conclusions

1. Four kinds of abnormality have been observed among 58 enteric group strains isolated from the urine of Egyptian food-handlers: loss of ability to produce gas in fermentation, dwarf colony production, loss of flagellar antigen and roughness. Study of the first two is recorded.

2. One strain of *Salm. paratyphi C* was persistently anaerogenic. Twelve *Salm. paratyphi A* strains showed transient inability to produce gas from varying sugars; an apparently stable anaerogenic mutant was obtained from one of them. It seems possible that salmonella variants which are unable to produce gas occur quite commonly, but that their presence is nearly always masked by the gas

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produced by normal organisms in the same culture. Failure by a normally aerogenic species to produce gas does not affect the *p*H changes in the medium or the death rate of the organisms in the culture.

3. The acid tolerance of *Salm. paratyphi A* and *Salm. paratyphi C* appears to cease at about *p*H 4.8. This acidity is commonly reached in three days in glucose. It seems possible that acid intolerance may cause failure of isolation from acid urine, or even intermission or cessation of urinary carriage. It had previously been found (Archer *et al.*, 1952) that the reaction of urines sent for culture varied between *p*H 4.8 and *p*H 8.0 and that urine freshly passed by carriers lay between *p*H 5.5 and *p*H 7. One of a number of tests since carried out detected a urine of *p*H 4.73. On the other hand, in suitable specimens at refrigerator temperature, viability of the carried species in the urine of carriers may be considerable. Approximately 100 per cent. survival of *Salm. typhi* for one week was previously recorded (Archer and Ritchie, 1950). Later tests showed 36 per cent. survival of 5,000 *Salm. typhi* per ml. after 14 days, 36 per cent. survival of 11 million *Salm. typhi* per ml. after 10 days, not less than 44 per cent. survival of 68,000 and 5 per cent. survival of 21,000 *Salm. paratyphi A* per ml. after one week. *p*H of these specimens was unfortunately not recorded. Improved results in the detection of urinary carriers might follow if the reaction of fresh specimens was taken and, where a negative result was found following the culture of a highly acid urine, arrangements were made for the administration of an alkaline mixture before the second specimen was taken. The possibilities of acid reaction as a cause of failure of isolation, intermission of carriage or spontaneous cure, and of the use of acidification in treatment, merit investigation.

4. Dwarf colonies were produced by a strain of *Salm. typhi* and a strain of *Salm. paratyphi A*. Growth of inocula of these variants was normal in certain types of media to which sodium thiosulphate had been added. The *Salm. typhi* strain was persistently excreted in both normal and dwarf form by the carrier for nearly a year. Variation of this strain *in vitro* in both directions ($L \rightleftarrows D$) was observed.

Acknowledgments

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SKI-ING INJURIES IN THE ARMY IN EUROPE

BY

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WHILE ski-ing has been a popular sport among officers of the army for many years, it is only during the last decade or so that it has come to be regarded as a valuable part of a soldier's training. During the war a few formations were trained in France, Canada and the Highlands, and, since 1945, the occupation of parts of Europe has made ideal training grounds available to teach men a method of locomotion which may be of value in future wars. Most of this training is done at an Army Winter Training Centre, where the permanent medical officer is himself an expert skier, and where the instruction is in the hands of some of the leading national exponents. All the instruction there is strictly supervised both by the instructors and by the medical officer, and every effort is made to ground men fully in the art and to toughen them up before they are allowed to risk themselves on the more difficult slopes. In spite of this, accidental injuries do occur, and a consecutive and unselected series of 517 cases occurring during the year 1951 has been analysed in the belief that it might be of some value. Of these, 100 were admitted to hospital, and 417 were treated at the Training Centre.

CASES TREATED AT THE ARMY WINTER TRAINING CENTRE

In the period reviewed, over 400 minor injuries were treated in the Medical Centre attached to the Training Centre, and these are listed in Table I. The only interesting fact which emerged from the study of these minor injuries was that they all occurred in absolute novices during their first three weeks' instruction and affected about one-third of those at risk.

TABLE I

Sprains of knee	143
Sprains of ankle	137
Wounds (incised)	4
Wounds (punctured)	3
Blisters of heel	130
	417

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Cases admitted to Hospital

One hundred cases were admitted to hospital and these have been studied in greater detail. A questionnaire was prepared and made out for each patient (see Appendix). Particular attention was paid to the individual's experience as a skier, and they were grouped as follows :

Group 1 : 19 skiers with more than one year's experience ;

Group 2 : 13 skiers with more than one month but less than one year's experience ;

Group 3 : 68 novices with less than one month's experience ;

and these groups were further considered with particular reference to : (*a*) type of snow ; (*b*) type of fall ; (*c*) presence or absence of a hazard ; (*d*) severity of injury.

Group 1.—There were 19 in this group, a larger proportion of whom had serious injuries (see Table II).

Table II.—Nature of Injuries, Group 1

Protrusion of cervical disc	1
Fracture of tibia and fibula	8
Pott's fracture	5
Torn medial ligament, knee	3
Torn lateral ligament, ankle	1
Dislocation of shoulder	1
	19

(*a*) Type of snow : This varied markedly and did not seem to be in any way significant.

(*b*) Type of fall : It was difficult to get an accurate description of the actual type of fall, but it was possible to group them generally into twisting or straight falls, and it was found that each type accounted for about half the cases.

(*c*) Hazard : 13 of the 19 cases gave a history of a definite hazard varying from snow-covered rocks and hidden tree trunks to sudden dips which required an immediate jump. This was in marked contrast to the less experienced groups, as can be seen from Table III.

Table III.—Hazard in Relation to Experience

	Positive Hazard	*Negative Hazard*
Inexperienced skiers	18	63
Experienced skiers	13	6

$\chi^2=14.59$; $P<0.01$; i.e., experienced skiers' accidents are more often caused by hazard than those of the inexperienced.

(*d*) Type of Injury : Here again the experienced skiers showed a high proportion of serious injuries, whereas the novices seldom injured themselves badly (see Table IV).

Table IV.—Severity of Injury in Relation to Experience

	Serious Injury	*Minor Injury*
Inexperienced skiers	2	79
Experienced skiers	9	10

$\chi^2=31.5$; $P<0.01$; i.e., if an experienced skier is injured, he is more likely to sustain a serious injury than an inexperienced one.

Table V.—Severity of Injury in Relation to Hazard

	Serious Injury	*Minor Injury*
Inexperienced skiers	0	18
Experienced skiers	6	7

$\chi^2=10.41$; $P<0.01$; i.e., hazards tend to be associated with more serious injuries in experienced skiers than in inexperienced skiers.

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Group 2.—These are the skiers with between one month and one year's experience. There were 13 cases in this group (Table VI) only one of whom had a severe injury, and 8 of them attributed their accident to a definite hazard.

TABLE VI.—NATURE OF INJURIES, GROUP 2

Pott's fracture (second degree)	1
Pott's fracture (first degree)	8
Torn lateral ligament, ankle	3
Torn medial ligament, knee	1
	13

Group 3.—There were 68 cases in this group (Table VII).

TABLE VII.—NATURE OF INJURIES, GROUP 3

Torn medial ligament, knee	15
Torn lateral ligament, ankle	13
Pott's fracture (first degree)	17
Subluxation, tibio-fibular joint	5
Torn medial cartilages	4
Fractures of tibia and fibula	1
Remainder (varied)	13
	68

(*a*) Type of snow: About 70 per cent. of these novices attributed their fall to ski-ing off pista (a prepared ski run) into soft snow, and it would appear that this can be regarded as a natural hazard to the beginner.

(*b*) Type of fall: Of the 68, 49 stated that they had had a twisting fall, whereas only 19 had straight falls.

(*c*) Presence of hazard: Only 10 gave a history of a definite hazard other than ski-ing off pista into soft snow.

(*d*) Type of injury: A marked feature of this group was the absence of severe injury (throughout this paper only fractures of the tibia and fibula, second degree Pott's fractures and protrusion of the intervertebral disc have been regarded as serious). This becomes even more significant when one considers that all the minor strains, etc., treated as outpatients occurred in skiers with under one month's experience.

TABLE VIII.—SUMMARY OF INJURIES, ALL GROUPS

Pott's fracture	31
Torn lateral ligament, ankle	17
Torn medial ligament, knee	19
Fracture of tibia and fibula	9
Torn cartilage, knee	4
Sublaxation, tibio-fibular joint	5
Remainder (varied)	15
	100

Table VIII lists the lesions found in the 100 cases admitted to hospital, and a consideration of them shows that a sudden twist of the body on a leg anchored by the long ski is the common mechanism of injury. For example, of the 31 Pott's fractures, 14 were oblique breaks of the lateral malleolus with posterior displacement and five were fractures of the lower third of the fibula with the lower fragment rotated backwards. The others varied, but in every case there was external rotation. Of the 9 fractures of the tibia and fibula, 7 were

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spiral or oblique breaks of the lower third of the tibia associated with a fracture in the upper third of the fibula. It is reasonable to suppose that a similar strain caused the majority of the other ankle and knee injuries. Out of a total of 22 severe ankle sprains, 5 were complicated by diastasis of the inferior tibio-fibular joint.

Discussion

There is a common superstition among skiers that, while a novice always hurts himself, only the experienced skier is ever severely injured, and this would certainly seem to be borne out by the present series. The experienced skier is the victim of a real accident in that he strikes some physical hazard while going hard and fast, and the result is a serious injury. We have knowledge of two deaths, a fracture of the spine, and a comminuted fracture of the sacrum, occurring in skiers of international class. The novice, on the other hand, is struggling with unaccustomed equipment on prepared ground and his injury, usually due to a twisting fall, would appear to be due to his own awkwardness and lack of training. At the Centre in the period under review, out of some 1,300 men under training almost 500 injured themselves at this stage, and it would appear to be worth while investigating ways of cutting down this wastage. It might be of advantage to lengthen the period of preliminary training and toughening-up of these beginners by physical training and dry-shod exercises. The possible advantage of starting off on the level with Langlauf (cross-country) skis is in our opinion worthy of consideration. It would appear to be to the Army's advantage to have many men able to make their way across snow-covered country on skis rather than a few able to take part in down-hill races.

On undertaking this study, we had hoped that it might confirm some preconceived ideas we had about ski accidents and their causation, and might therefore be of help to those responsible for the early training of adult skiers. However, so many factors are involved that a much longer series over a period of several years is really required before any definite conclusions can be drawn. We feel, however, that this is a beginning, and that we have shown the number and types of injuries to be expected. This should be of some help to medical planners and to those responsible for organizing courses.

We wish to acknowledge our indebtedness to Captain G. Anderson, R.A.M.C., who dealt with all the minor cases and provided us with the relevant information, and to Captain M. Whiteley, R.A.M.C., who looked after a large proportion of the hospital cases. We wish also to thank Lieutenant J. M. Brooks, Q.A.R.A.N.C., who kindly undertook the secretarial work; Colonel W. A. R. Ross, D.D.M.S., and Lieut.-Colonel R. Johnston, R.A.M.C., Officer Commanding, B.M.H., who have given us every encouragement and have permitted us to publish this paper; Major G. Fraser Anderson, R.A.M.C., who advised in the statistical analysis; and Major P. J. C. Burton, R.A.M.C., for expert assistance, as a skier, in preparation of the questionnaire.

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APPENDIX

SKI ACCIDENT INVESTIGATION

No.................. Rank........................ Name..

Unit.. PULHEEMS PES CP.......................

Location of Accident..

ÆTIOLOGY OF ACCIDENT : Patient's Description (P.T.O.)..

Hazard...

What attempting to do at time ?..

Straight Fall ?...

Twisting movement ?...

Direction : Forward ?.................. Backwards ?.................. Sidewards ?..................

Speed of travel ?..

Downhill ?............................. Direct ?........................... Traverse ?......................

SKI-ING EXPERIENCE :

Under direct supervision of Instructor ?...

Ski-ing alone ?...

TYPE OF SNOW :

Powdered.................. Semolina.................. Ice.................. Thawing snow..............

Untracked.......................... Rutted.......................... Pista..........................

Off pista into fresh snow...

Fresh snow on previous pista..

EQUIPMENT : *Own* *Army* *If Damaged*

Type of Skis ....

Type of Boots...

Type of Bindings...

NATURE OF INJURY :

Soft tissue ....

Bone...

Site ....

Type...

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INFECTIVE HEPATITIS WITH HEPATIC CIRRHOSIS

BY

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THE patient was a thirty-four-year-old British soldier who had been a prisoner of war in German hands from 1940 until he was liberated in 1945. He was on the "thousand-mile forced march" from Poland to Germany in the face of the advancing Russian Army. While in captivity he had little food to eat and his meals were very small. On return to the U.K. he found that he could never eat more than very small meals without feeling sick and vomiting. This state of affairs continued, but in spite of that he must have eaten adequate food as he appeared to be of average nutrition.

He was admitted to B.C.O.F./29 General Hospital on 16th February, 1951. A fortnight previously, he reported sick when he began to complain of anorexia and nausea. About nine days later, he noticed that his eyes and skin were yellow in colour and that his urine was dark. On admission to hospital he was deeply jaundiced, the liver was palpable two finger-breadths below the right costal margin and it was tender. The spleen was just palpable, the stools were pale and the urine contained bile pigments, bile salts and an increased amount of urobilinogen, but nothing abnormal was noted on microscopic examination. He was febrile (T. 100.8° F.), but he became afebrile the next day. Blood films, thick and thin, showed no evidence of malarial parasites, etc.

He was treated with a high protein, high carbohydrate, high vitamin and fat restricted diet.

21st February, 1951: Serum bilirubin, 12.8 mg. per cent. Thymol turbidity, 8.0 units.

7th March, 1951: W.B.C., 8,000 per cu. mm. (Polys, 62 per cent. Lymphs, 32 per cent. Monos, 2 per cent. Eosins, 4 per cent.)

8th March, 1951: Serum bilirubin, 9.75 mg. per cent. Thymol turbidity, 10 units. Takata Ara—positive.

On 9th March, 1951, he appeared to be making slow but definite progress. His appetite was better and his stools were darker. However, on 10th March, 1951, he complained of flatulent abdominal discomfort, his appetite was poor, the liver was palpable three finger-breadths below the right costal margin and

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he began to run an irregular pyrexia. He vomited on 12th March and again on 13th March, when examination revealed marked abdominal distension with bulging in the flanks, shifting dullness and a fluid thrill. There were no petechiæ. Paracentesis abdominis was carried out and 82 ounces of bile-stained fluid were removed. The laboratory report on the fluid was as follows: R.B.C.+++. Nucleated cells. No bacteria seen. Small lymphos, 95 per cent. Endothelial cells, 4 per cent. Neutrophils, 1 per cent. No A. & A.F.B. seen. Total protein, 2.7 g. per cent. ***Culture:*** Sterile after 48 hours.

He was given procaine penicillin, 300,000 units intramuscularly daily, but this had to be stopped when he developed a generalized urticarial reaction which was treated with pyribenzamine, an anti-histamine preparation.

13*th March*, 1951*:* Blood urea, 62 mg. per cent. Serum bilirubin, 14.2 g. per cent. Plasma proteins, 7.134 g. per cent. Urine cultures (6), sterile. Stoo cultures (6), no pathogens isolated.

Repeated microscopic examination of stools revealed no evidence of intestinal parasites.

X-ray of abdomen: Calcified glands on both sides of abdomen. No other abnormality seen.

15*th March*, 1951*:* He was still febrile. The urine was heavily bile-stained and contained a trace of albumin, with plentiful casts, which were chiefly granular, though a few were epithelial and hyaline. A single leucine crystal was seen. Very occasional pus cells and R.B.Cs.

Serological tests for leptospirosis were negative.

On 17th March, 1951, it was evident that paracentesis abdominis was necessary and 76 ounces of bile-stained fluid were removed. Repeated blood counts showed no evidence of mononucleosis.

19*th March*, 1951*:* Plasma proteins, 6.02 g. per cent. Serum bilirubin, 12.8 mg. per cent.

He was still febrile (101.4° F.) and there were numerous fine crepitations at the base of the right lung. The total and differential white blood cell count was within normal limits. He was ordered chloromycetin 4 g. stat. and ½ g. six-hourly with evident improvement.

He became afebrile on 21st March, 1951, when examination of his heart revealed occasional extra systoles. He was now eating well and his stools were obviously bile stained. Chloromycetin was stopped on 23rd March, 1951, and jaundice appeared to be lessening appreciably.

He became febrile again on 26th March, 1951, and on 27th March, 1951, he felt very ill. There was now pitting œdema of both feet, ankles and legs, and pitting on pressure over the sacrum. The abdomen was markedly distended. Paracentesis abdominis was carried out for the third time and five pints of bile-stained fluid were removed. The fluid had the same characteristics as on the first occasion. B.P. 130/88. The pulse rate swung between 70 and 90. Blood culture was sterile. Chloromycetin was exhibited again.

On 29th March, 1951, the liver edge was palpable two to three fingerbreadths below the right costal margin and the œdema of the legs appeared to

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have gone, but there was still some pitting over the sacrum. He was seen by Lieut-Colonel J. C. Watts, *M.C.*, Surgical Specialist, who considered that there was no indication for surgery and concurred with the diagnosis of infective hepatitis with hepatic cirrhosis.

On 31st March, 1951, he felt much better although he still had a low grade pyrexia. Serum bilirubin was now 8 mg. per cent. The urine was less obviously bile-stained. He was now eating extremely well; in actual fact he had two meals at each meal time, i.e., he was eating larger meals than he had ever eaten in his life before.

On 1st April, 1951, his abdomen was markedly distended and once more there was gross pitting œdema of the lower limbs and over the sacrum. Paracentesis abdominis was carried out and 76 ounces of bile-stained fluid removed. The plasma proteins were now 4.46 g. per cent. and serum bilirubin 5.8 mg. per cent. He now had obvious hypoproteinaemia and two pints of plasma were given slowly intravenously. Chloromycetin was continued. He was given two pints of plasma on 3rd April, one pint on 4th April and two pints on 5th April. Paracentesis abdominis was repeated on 4th April, 1951, and 65 ounces of fluid obtained. B.P. 130/90. On 5th April he developed lymphangitis of the right arm where he was having plasma. Chloromycetin was stopped and aureomycin 1 g. stat. and 250 mg. six-hourly exhibited. B.P. 125/85. Plasma proteins were now 4.9 g. per cent. X-ray of chest revealed obliteration of the left costophrenic angle, ? due to fluid.

6th April, 1951*:* Appetite excellent. Blood urea, 28 mg. per cent. R.B.C., 3.5. million per cu. mm. Hb., 10 g. per cent. He was given a further two pints of plasma intravenously.

7th April, 1951*:* Paracentesis abdominis repeated and 65 ounces of bile-stained fluid obtained, of protein content 2.5 g. per cent. He was now given Campolon 10 ccs. intramuscularly for five days and two tablets of ferrous sulphate thrice daily.

8th April, 1951*:* No œdema apparent anywhere. Eating extremely well. Feels very much better but is still febrile.

9th April, 1951*:* Transfusion of one pint of fresh blood. Plasma proteins, 5.5 g. per cent. Temperature had now become normal.

10th April, 1951*:* Aureomycin continued. Paracentesis abdominis carried out for the seventh time and 72 ounces of bile-stained fluid removed. He was now very much better and fit to be evacuated to the U.K. by air. His name was removed from the D.I.L. and placed on the S.I.L. He left on his long journey to the U.K. on 11th April, 1951. He was afebrile and, though he still had demonstrable fluid in the abdomen and his liver was easily palpable, his appetite was excellent, the serum bilirubin was falling, the urine contained appreciably less bile, the stools appeared to be of normal colour and the plasma proteins were rising. He was given a supply of aureomycin to last the journey to the U.K.

He arrived at the Military Hospital, Tidworth, on 24th April, 1951, where Major J. P. Baird, R.A.M.C., reported as follows: "Feels well. Appetite good and abdomen feels comfortable. No evidence of anorexia. Liver enlarged three

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finger-breadths—nodular—not tender. Spleen not palpable. Moderate ascites. No œdema.

Blood: Total proteins, 6.0 g. per cent ; albumin, 4.2 g. per cent. ; globulin, 1.8 g. per cent. ; R.B.C., 4 million per cu. mm. ; Hb., 14.8 g. per cent. ; serum bilirubin, 1.1 mg. per cent. ; thymol turbidity, 1 unit ; blood cholesteral, 112 mg. per cent. ; W.R. and Kahn, negative ; Rhesus group, negative.

Urine: No bile salts or bile pigments present. Urobilinogen, negative.

Progress: Aureomycin was stopped on day of admission. No evidence of pyrexia. His clinical condition has steadily improved. The ascites slowly disappeared and futher paracentesis was not needed. His weight has steadily increased and there is now (7th June, 1951) no evidence of jaundice. Now active all day and feels very fit.

Present Condition (7th June, 1951): Weight, 11 st. 4lb. No jaundice. No evidence of anorexia. No free fluid in abdomen. Liver edge palpable one finger—fine and nodular. No œdema.

Blood Chemistry: Total proteins, 6.5 g. per cent. ; albumin, 4.8 g. per cent. ; globulin, 1.7 g. per cent. ; serum bilirubin, 0.3 mg. per cent. ; thymol turbidity, 1 unit ; thymol flocculation, negative.

Urine: No albumin. No abnormal biliary constituents.

Disposal: Sent on sick leave for one month. To return for further observation."

The following additional information was received from Major J. P. Baird, R.A.M.C., in a letter dated 16th July, 1951 :

"He remains well, has plenty of energy and an excellent appetite. He has been fully active while on leave. Examination shows no jaundice and he is not clinically anæmic. There is no glandular enlargement and the liver and spleen are not palpably enlarged. His weight is 12 st. 5 lb. and the following investigations were performed :

Blood: Hb., 15.5 g. per 100 ml. (104 per cent.); R.B.C., 5.3 millions; E.S.R., 5 mm. in first hour (Wintrobe) ; serum bilirubin, 0.4 mg. per 100 ml. ; serum protein, 7.5 g. per cent. ; albumin, 5.0 g. per cent. ; globulin, 1.9 g. per cent. ; thymol turbidity, 1 unit.

Urine: No bile pigments or salts present.

The patient has been downgraded to P7 (H.O.) and returned to his depot."

Commentary

It is accepted that malnutrition can result in cirrhosis of the liver. It is possible that during several years of captivity this soldier's liver suffered damage due to sub-nutrition and that when he developed infective hepatitis it suffered further and severe damage resulting in marked cirrhosis with ascites, hypoproteinæmia and secondary pitting œdema of the extremities and over the sacrum.

This was combated by plasma intravenously supplemented by a transfusion of one pint of fresh blood to help counteract the anæmia and as a tonic in this case of prolonged active infection. He had large doses of liver extract intramuscularly as well as ferrous sulphate and vitamin supplements by mouth.

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There is no reason to doubt that this was a case of infective (viral) hepatitis, and not just a manifestation of leptospirosis, enteric-group fever, infective mononucleosis, staphylococcal septicæmia, amœbiasis or other conditions. The prolonged and irregular pyrexia was most unusual in our experience of infective hepatitis, but it may just have been "hepatic fever" and, therefore, just a measure of active and extensive liver damage. Of course, secondary infection had also to be considered. The voracious appetite developed by the patient while he was still extremely ill was taken as a most welcome prognostic sign. It is felt that one of the best liver function tests is a good appetite.

The rapid response to treatment with chloromycetin when first exhibited was of interest, as was the response to treatment with aureomycin following the development of lymphangitis during the intravenous administration of plasma whilst the patient was having a second course of chloromycetin.

What the future of this case is likely to be is difficult to say. The liver has great powers of recovery, but if it has suffered severe and extensive damage and there is gross post-necrotic scarring, then he may not live more than a year or so. There is no doubt that the patient did extremely well and it is felt that in some measure this was due to the manner in which the case was managed and nursed. However, it is not the worst case of infective hepatitis that we have seen recover.

Our knowledge of the mode of spread of this disease has increased during the past decade. However, in spite of the fact that some individuals continue to speak of post-arsphenamine jaundice, homologous serum jaundice, etc., it would appear to be fairly well established that these terms are synonyms for one disease in which the virus may enter the human body by droplet infection, by the ingestion of contaminated food and water, or be introduced through the skin, the result of venepuncture, blood transfusions, infusions, injections of any type, vaccinations, tattooing, and insect bites, especially by blood-sucking insects which are really viable needles and syringes.

The principles of treatment of infective hepatitis are a high protein, high vitamin, high carbohydrate and fat-restricted diet. Where the appetite is poor, extra protein can be given as Casinal (Bengers) or Casilan (Glaxo). Such cases normally have barley sugar by the bedside and have extra glucose in fruit drinks as well as vitamin supplements. Severe and urgent cases, especially those of acute hepatic necrosis, are best treated on the lines indicated in the *Brit. med. J.*, 30th September, 1950, and the *J. Roy. Army Med. Corps*, December, 1947, No. 6, Vol LXXXIX, pp. 290—300.

All cases of infective hepatitis are normally kept in bed until the urine is normal, and after one week up and about they are sent on a fortnight's convalescence at the Rehabilitation Centre. None of these cases are subsequently accepted as blood donors.

It is normal practice in the Army to advise all cases to avoid alcohol and most anæsthetics except in an emergency for six months at least. In our extensive experience of this disease the only relapses we have seen have been in those who did not follow our advice regarding alcohol.

It is known that the virus of infective hepatitis is passed in the urine and stools.

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It may be of interest to record that one medical officer, who zealously tests for bile pigments every day in these cases by the "froth" test, developed infective hepatitis. It was suggested that his fingers had become contaminated with the infected urine. Whether or not such was the mode of transmission of the virus of infective hepatitis in the case of this M.O., it is at least feasible and possible and is well worth bearing in mind.

Acknowledgments

We wish to thank Colonel C. W. Nye, D.D.M.S., British Commonwealth Forces, Korea, and Colonel J. E. Snow, *O.B.E.*, Commanding 29 General Hospital, for permission to forward these notes for publication ; Lieut.-Colonel J. C. Watts, *M.C.*, M.B., F.R.C.S.(Eng.), R.A.M.C., Captain R. Andrew, R.A.M.C., and Captain D. G. Miller, R.A.M.C., for their help with this case ; Major J. P. Baird, M.B., M.R.C.P.(Edin. & Lond.), for the progress notes ; Captain G. A. K. Missen, R.A.M.C., for the laboratory investigations ; the nursing officers, Q.A.R.A.N.C., for their great nursing skill ; the nursing orderlies, R.A.M.C., for their devotion ; and No. 19136490 Pte. J. Downey, R.A.M.C., for typing these notes during his off-duty hours.

PRIMARY CARCINOMA OF THE STOMACH IN A WOMAN AGED TWENTY-FIVE

BY

Colonel L. R. S. MacFARLANE, O.B.E., M.D., D.P.H.

and

Captain M. A. PEYMAN, B.M., M.R.C.P.

Royal Army Medical Corps

THE following case is of interest owing to the rarity of the condition at this age.

Mrs. S., wife of a soldier, was admitted to the Louise Margaret Hospital, Aldershot, on 6th March, 1951, with seven months' history of loss of weight accompanied by vomiting. Vomiting was almost daily in occurrence, large amounts of food, sometimes mixed with blood, being brought up. During this period she developed a sense of fullness in the epigastrium after meals, but it is interesting to note that at this stage she did not experience any true anorexia. There were no other relevant symptoms apart from amenorrhœa for the previous eight months.

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Clinical examination revealed an emaciated young woman with atrophied breasts and a fine growth of downy hair on the trunks and limbs. There was no lymphadenopathy and no pigmentation. The abdomen showed a smooth, firm, non-tender mass in the right epigastrium with waves of gastric peristalsis moving across from under the left costal margin towards the lump. No other lumps were palpable. The liver and spleen could not be felt. There was no abdominal tenderness and no ascites. Both rectal and vaginal examinations revealed no abnormalities. No clinical or radiological abnormalities were detected in the chest. The results of special investigations done were as follows: (1) Hæmoglobin, 12.5 per cent.; R.B.C., 4,230,000 per cu. mm.; W.B.C., 6,000 per cu. mm. (polys., 75 per cent.; lymphs., 25 per cent.); E.S.R., 12 mm. in 1 hr. (2) Test meal: (*a*) fasting specimen showed free acid present; (*b*) after histamine, the curve was hypochlorhydric in type; (*c*) blood, but not lactic acid, was present in the juice; (3) W.R. and Kahn, negative; (4) barium meal revealed a constriction of the lower part of the body of the stomach with loss of normal rugal pattern. No ulceration or pyloric obstruction was detected. No examination for occult blood in the stools was done.

In view of the age of the patient, the diagnosis of carcinoma of the stomach was considered with some doubt. The possibility of sarcoma or tuberculosis of the stomach was entertained.

At laparotomy by Mr. P. J. M. Wright, F.R.C.S., on 25th March, 1951, the whole stomach was rigid and thickened by a growth; it had a leather-bottle appearance and was considered to be carcinomatous. The cœliac glands were enlarged. A total gastrectomy was performed together with removal of the cœliac glands, and an anastomosis between the abdominal œsophagus and jejunum was established. During the course of the operation the spleen was removed in order to secure a more satisfactory gland resection. The immediate post-operative progress was satisfactory. She left hospital one month after the operation free of symptoms.

Pathology.—Macroscopically, a leather-bottle stomach, completely infiltrated with growth and containing three ulcers along the lesser curvature. Sixteen lymph nodes, two of which were sectioned, were seen on the lesser curvature. Microscopically, a frozen section of lymph gland showed carcinoma simplex. Paraffin sections showed the stomach to be infiltrated by carcinoma simplex, most marked round the ulcers. Lymph channels were filled with tumour cells. Growth extended to the amputation lines. The ulcers were acute and showed no muscle destruction. Lymph nodes showed heavy infiltration by carcinoma simplex.

The patient was readmitted on 20th July, 1951, four months after operation, with a history of persistent vomiting and venous thrombosis for the previous two weeks. Clinical examination revealed considerable abdominal tenderness, although no lumps were palpable and no ascites was detected. The diagnosis of subacute intestinal obstruction, probably due to secondary deposits, was made. Although both vomiting and tenderness continued and she was rapidly losing weight, the patient was later discharged.

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On 29th October, 1951, she was readmitted for relief of gross ascites. She was bedridden and markedly cachectic, and both legs had massive œdema. Paracentesis abdominis was performed on 30th October, 1951, with much relief. She collapsed and died on 1st November, 1951.

Post-mortem Report

Body of an emaciated female, appearing considerably older than known age. Old scar on upper abdomen. Trocar and cannula stab on lower abdomen.

On opening the body the following were found : *Chest:* Fluid in pleural cavities. *Abdomen:* Full of darkish turbid fluid ; oozing seen from transverse colon which was involved in a matted mass of glands and omentum. Numerous dense adhesions. Peritoneal surface of intestines red and flaky, more so in the lower abdomen, with typical bread-and-butter appearance of peritonitis. No signs that tapping was cause of injury to gut. Carcinomatous spread macroscopically noticeable in abdominal para-aortic glands. Brain not examined. No obvious metastases in bones. A splenunculus was present.

Microscopy.—Lungs, kidneys, bladder, heart and thyroid normal. Uterus : malignant-cell infiltration of lymph-spaces of fundus. Splenunculus, pancreas and abdominal, peri-aortic, parabronchial and cervical lymph-nodes : carcinomatous infiltration. Small intestine : malignant cells seen between musculature and submucosa. Œsophagus : slight carcinomatous spread about one inch about operation level.

Discussion

Primary carcinoma of the stomach is rare under the age of 30 (Willis, 1948), although cases have been proved at ages of 21, 18 and 9 (Kaufman, 1929) and 13, 14 and 15 by other writers. The mean age for carcinoma of the stomach, according to Willis, is 62.3, and, to Poscharisskey (Moscow) (1930), 54 years. The condition is more common in males, the Registrar-General's figures for 1930-32 showing the ratio to be 2 : 1. Kaufman had 394 male and 277 female cases in his series, Poscharisskey 345 male cases and 155 female in his, and Willis 157 male to 70 female. Finally, invasion of the whole body of the stomach accounts for only 8 per cent. of all cases in the combined series of Willis (1948), Poscharisskey (1930) and Stewart (1931).

Our thanks are due to Major-General T. Menzies, *C.B.*, *O.B.E.*, M.D., K.H.P., D.D.M.S., Southern Command, for permission to publish this case.

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Matters of Interest

NEW YEAR GREETINGS FROM THE D.G., A.M.S.

To all Ranks, past and present, of the three Corps of the Army Medical Services I send my very best wishes for a happy and prosperous New Year.

F. HARRIS, *Lieutenant-General,*
Director-General, Army Medical Services.

INDEX, VOLUME 98

With this issue, every subscriber will receive a copy of the title page and index to Volume 98 (January—June, 1952), the first to be printed since that for Vol. 92. If you wish to receive future indexes as published, please inform the Manager NOT LATER than 1st August, 1953, as, in the interests of economy, no universal distribution will be made of subsequent issues.

THANK YOU!

Some of our subscribers will have seen, with pleasure, the graceful notice of this Journal—"In Arduis Fidelis"—which appeared in *The Medical Officer* for 20th September, 1952. We are very grateful, and we hope to remain—*fideles.*

R.A.M. COLLEGE—EXAMINATION SUCCESSES

The following officers have obtained the additional qualifications noted :

D.P.H (Lond.)—Major F. J. W. Hooper, July, 1952 ; Lt.-Col. M. Abbas, (Pakistan A.M.C.), July, 1952.

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Book Reviews

INFORMATION DIGEST. Central Council for Health Education. London: 1952. Second issue. Pp. 90.

This Digest is addressed to an audience which has more than a general interest in Health Education, an audience whose members have the same purpose but a variety of professional backgrounds and qualifications. It is on the familiar lines of existing publications in the field of Public Health, such as the *Bulletin of Hygiene*, from which, indeed, many of the abstracts are taken. The remainder consists of abstracts of articles in such familiar periodicals as the *Lancet*, the *British Medical Journal*, the *Medical Officer*, the *Monthly Bulletin of the Ministry of Health*, etc.

The Editorial Notes state that the extracts are intended to convey current opinions as well as factual evidence. "There is no attempt at review and no comment is intended. Introductory notes at the head of each section are merely for the reader's guidance."

The Digest is divided into six sections whose subjects are chosen from the whole extent of Public Health and which will presumably vary in subsequent issues. They comprise Immunization, B.C.G., Stress, Psychosomatic Disorders, Food Poisoning and Atmospheric Pollution. The Introductory Notes outline the present state of the subject, which is then well illustrated by a number of abstracts.

The selection of a few subjects for each issue from the full range of Public Health has its dangers, especially to those who may be tempted to rely entirely on *Information Digest* for their knowledge of recent progress in this field. Gaps must necessarily exist. Certainly, *Information Digest* cannot replace the comprehensive *Bulletin of Hygiene* for those who are medically qualified. An important responsibility of the Editors will be to ensure that a balanced picture is presented in successive issues and that no aspect of Public Health or Health Education is given undue prominence at the expense of the others.

R. J. N.

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THE CLINICAL APPLICATION OF ANTIBIOTICS (PENICILLIN). M. E. Florey. Oxford University Press (Geoffrey Cumberlege). 1952. Pp. 602+13. 84s.

This work must rank as the most exhaustive survey of any one drug—if one may class penicillin as a drug—ever published. Every conceivable aspect of the use of the substance, dosage, diseases and conditions concerned, etc., are covered. The exact dose, use, and precautions in use for any condition imaginable, together with statistics as to previous successes and failures, can be turned up at will. This is not a "book for the fireside," but in a reference shelf it will be invaluable.

If there is any criticism, one might suggest a little more reference to the actual performance of penicillin level estimations and general laboratory technique in this field.

In addition, the practice of giving just one case as an example of success or otherwise in penicillin treatment of a particular condition is one which may not recommend itself to readers.

L. M.

FIRST REPORT OF THE EXPERT COMMITTEE ON TRACHOMA. W.H.O. Technical Report Series No. 59. H.M.S.O. 1952. Pp. 22. 1s. 3d.

This small report describes the work of the first meeting of the Expert Committee on Trachoma of the World Health Organization. Details are given of recommended courses of therapy for the disease and of a suitable organization for its treatment and control in under-developed countries. It is interesting to note that the Committee considers that fly control plays an important role in the prophylaxis of the disease, and it is clear that the general hygiene measures such as are used as a routine in the British Armed Forces would be adequate to control any outbreak. Suggestions are made as to suitable prophylaxis in International Traffic, and finally the more urgent research problems which confront workers on Trachoma are indicated.

J. A. H. B.

HUMAN NATURE: ITS DEVELOPMENT, VARIATIONS AND ASSESSMENT. J. C. Raven, M.Sc. London: H. K. Lewis. 1952. Pp. xii+226. 12s. 6d.

This book is an attempt to present the subject-matter of psychology in a form which will be easily assimilable by a non-specialist audience, inside and outside medicine and nursing.

After an introductory chapter on biological growth and the nervous system, the book divides into three parts. In the first, after some general remarks on the scope and methods of psychology, the progress of normal development is traced from birth through adolescence and maturity to old age.

In the second part the author first deals with the mental hygiene problems, individual and social, of "Well-being" and "Dis-ease"; and then, in a long but perhaps less satisfactory chapter, curiously entitled "Introspective and Social

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Psychology," with a number of aspects of personality, the emotions, and human relationships.

The last part is an account of mental tests, their uses and their limits, supplemented by an appendix on some of the mathematical methods in most frequent use in psychological work.

The chief merits of the work are a readable style and an approach which introduces psychology in understandably human terms, rather than as yet another technology for nurses, doctors and others to practice on patients, and aims to influence that falsely "objective" attitude implicit in so many small but personal things in medical practice—for example, in the hospital notice, "Entrance for Skin Diseases" (instead of for people).

In his exposition the author is occasionally led into something like a cosy homily and opinions he would doubtless qualify if writing more formally at length. The method employed in the Index-Glossary of quoting independent definitions of key terms, followed by the page reference to the author's more individual formulations in the text, may not prove as helpfully lucid as he could hope.

Doctors and parents with an interest in selection methods in the Services, industry, or education should get a good general appreciation of the background and scope of current mental tests from the last section. Latter-day factorists may be surprised to see that four pages on factor analysis are entirely taken up with an exposition of the two-factor theory through the tetrad equation (though they had been warned that the author's outlook in these matters was *echt*-Spearman). But the statistical account should at least indicate to many that mental tests are not tortuous private puzzles concocted by pretentious (and probably unbalanced) pedants, but are set on the same logical base as many other established branches of the biological sciences.

B. C.

LUMBAR DISC LESIONS: PATHOGENESIS AND TREATMENT OF LOW BACK PAIN AND SCIATICA. J. R. Armstrong, M.D., M.Ch., F.R.C.S. Edinburgh: E. & S. Livingstone. 1952. Pp. 228. 42s.

I recommend this book to physicians, surgeons and obstericians of the Corps. In it there are provocative and didactic statements to which many may not subscribe, but these can be set aside if only for the emphasis that the author places on *adequate* conservative treatment of Lumbar Disc Lesions.

How many specialists in the Army can say that their patients with acute lumbar disc lesions do, in fact, have absolute and continuous *strict* bed-rest (in the supine position) and persist with it for half as long again as it took for the symptoms to disappear? And how many of these acute lesions, when they do get up, have protection to the spine for perhaps up to two months (*e.g.*, P.O.P. jacket, Goldthwaite belt), together with slowly graduated activities. The more frequent subacute lesions may not require bed-rest, but certainly the lumbar spine needs splinting and rest. This is achieved with a close-fitting spinal

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jacket worn for four to six months—not six weeks—and then followed by an adequate belt, together with restriction of the patient's activities. After all, one of the indications for operation on lumbar disc lesions is a failure of adequate conservative treatment.

This reviewer sees most disc-like lesions from abroad and from U.K. military hospitals and it is rare to read in the notes that there has been adequate conservative treatment. Instead, often because it has been inadequate, many of these acute and subacute lesions have drifted into a chronic low back syndrome and have to be invalided out. The author is so right when he emphasises that a damaged disc means, at best, a painless fibrous ankylosis between two vertebral bodies (and to achieve this, prolonged, enforced, uninterrupted rest is required), and, at worst, a painful unstable area, perhaps requiring a fusion operation.

Not many of us operate on the lumbar discs, and the pros and cons of various operative techniques are not important to the various specialists in the Corps who look after lumbar disc lesions. What is important is to agree with the author that the post-operative phase is up to one year of supervision, of low categories, of belts, and of graduated activities in order eventually to reach a higher category than the post-operative one.

The author's operative technique is a hemi-laminectomy, and he describes this operation in detail. This monograph of 228 pages is complete with anatomy, pathology, clinical features and the differential diagnosis, and is well punctuated with good illustrations.

C. M. M.

THE FOOT: THE EVOLUTION, ANATOMY, PHYSIOLOGY AND DISEASES OF THE FOOT IN THEORY AND PRACTICE. N. C. Lake, M.D., M.S., D.Sc. (Lond)., F.R.C.S. (Eng.). 4th Edition. London: Baillière, Tindall & Cox. 1952. Pp. vi+466. (166 figs.). 25s.

The demand for a fourth edition of this book within seven years shows that it has succeeded in the author's aim, *viz:*—to provide a volume which will be of value to chiropodists, physiotherapists, and other medical auxiliaries.

Much new material, including thirty new illustrations, has been incorporated to bring it up to date.

C. M. M.

ARCHITECTURAL PRINCIPLES IN ARTHRODESIS. H. A. Brittain, *O.B.E.*, M.A., M.Ch., F.R.C.S. 2nd edition. Edinburgh: E. & S. Livingstone. 1952. Pp. 425. 42s.

The second edition of this book is a worthwhile addition to the orthopaedic surgeon's library. The author's operation of ischio-femoral arthrodesis is now well established, and the book gives his latest technique. However, there is a tendency today to use more adduction than the author advises, and hence a shorter graft, with resultant more stable fixation. Further, most surgeons employ Foley's posterior incision, rather than the author's blind approach.

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In addition, the book gives a description of the author's method of arthrodesing all the joints of the body. Although an orthopaedic surgeon in the Army may not be called on to perform arthrodesis frequently and because, during his apprenticeship to orthopaedic surgery, he may have become proficient in one particular operation for arthrodesing a particular joint, it is always useful to have detailed descriptions of another surgeon's methods readily to hand.

This book is clearly written and well illustrated, and is recommended.

C. M. M.

OUT OF STEP. Joseph Trenaman. London: Methuen. 1952. Pp. xvii+223 (2 illustrations: 3 appendices). 21s.

The problem of the delinquent soldier is as prevalent in peace time, even if not as important, as it was in war time when manpower salvage was a pressing necessity. This book is a well detailed and readable study of those factors which underlie delinquency, and the methods which were adopted to return those "bad soldiers" to some form of gainworthy military employment. There is nothing in this book that is not known to the military psychiatrist or the efficient Personnel Selection Officer, but it is felt that it should be read by every professional soldier who, at some time in his career, has to command and administer troops. The factors of defective home conditions, unsatisfactory parent-child relationships and poor environment are suitably stressed and many of the shrewd observations which are made concerning the military delinquent could with value be utilised as the basis on which to readjust the chronic young offender in civilian life.

H. P.

The Editor regrets that space does not allow of printing reviews of the following:

RESEARCHES IN ENDOCRINOLOGY. A. A. Werner and associates. St. Louis, Mo., U.S.A.: 1952: Pp. 285.

LES SOURCES ACTUELLES D'UN DROIT INTERNATIONAL MEDICAL. B. de Féligonde. Liège and Paris. 1952: Pp. 152. 30 Belgian francs.

MEMORANDUM ON IMMUNOLOGICAL PROCEDURES. H.M.S.O. (War Office): 1952. Pp. 58. 2s.

PRE-EMINENT IN THE RELIEF OF PAIN. Slough: Hanovia Ltd. 3rd edition. 1952. Pp. 32. 2s. 6d.

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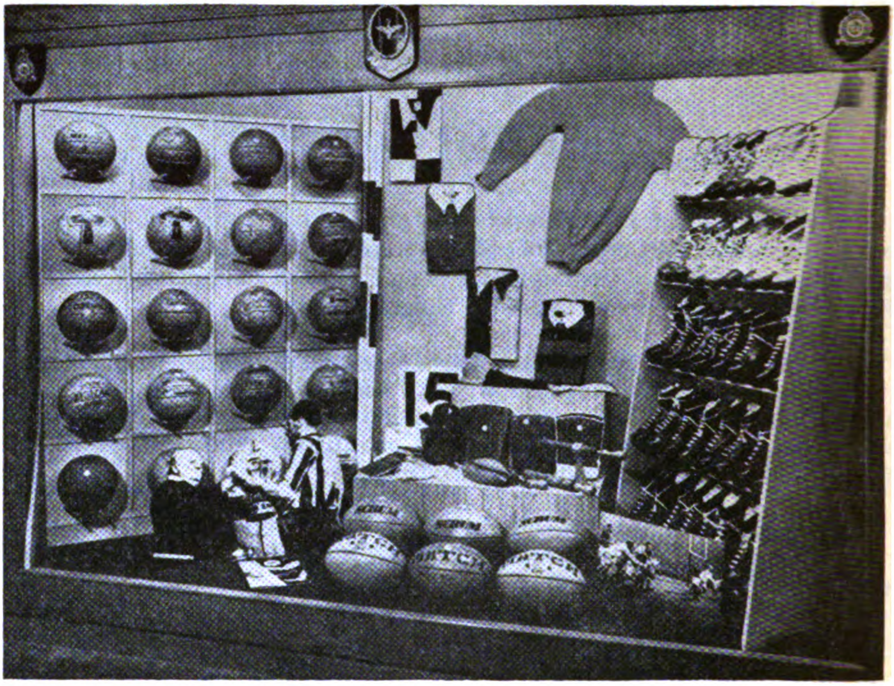

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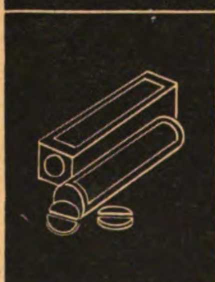

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

VI.—ANTIGENIC VARIATION AND VIRULENCE OF ISOLATED STRAINS

BY

Colonel G. T. L. ARCHER

THE fifth paper in this series (Archer, 1953) recorded the incidence of cultural and serological abnormalities among 58 strains of enteric group organisms isolated from the urine of carriers. The total was made up of 18 *Salm. typhi*, 30 *Salm. paratyphi A* and 10 *Salm. paratyphi C* strains. The opinion was also expressed that in many, but not all, cases, the deviation from the normal was transient and not due to dominant variation or persistent mutation. Cultural abnormalities in gas production and variants which grow as dwarf colonies on media lacking available sulphur were described in detail. Antigenic defects and the loss of virulence associated with roughness are described below. Strain numbers conform to strain numbers in the fifth, and excretor numbers in the second and fourth, papers in this series.

"H"→"O" VARIATION

It has long been known that *Salm. typhi* may have no "H" antigen on isolation. Bridges (1933) considered its absence fairly common, but very rarely prolonged *in vitro*. One of his strains remained aflagellate for about eight months. Colquhoun and Kirkpatrick (1932) described the use of soft agar to restore lost motility. More recently the lack of flagellar antigen in strains of *Salm. typhi* rich in Vi antigen and the effect of desoxycholate-citrate medium in suppressing flagellate growth have been observed. Hayes and Freeman (1945, 1946) note that

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absence of motility and of flagellar antigens is often met in recently isolated salmonella strains, but that motility is usually rapidly restored by one or more sub-cultures in nutrient broth or by soft agar. (Such an "O" phase is probably a temporary adaptation to environment.)

Criteria of permanence of absence of flagella given by Hayes and Freeman are :

1. No microscopic evidence of motility after sub-culture in broth or soft agar.
2. Complete "H" inagglutinability.
3. Inability to absorb "H" antibody.
4. Inability to stimulate "H" antibody production.

A mutant should satisfy them all. The second and third are also met by variants. Variants will, however, eventually fail to meet the first ; for example, the 901-O variant of *Salm. typhi* becomes motile in soft agar with a varying degree of readiness which seems to depend upon the care which has been exercised on the maintenance of individual strains. Variants may also fail to satisfy the fourth of these criteria even while continuing to satisfy the second and third. Thus Bridges' most markedly "O" strain had possibly evoked an "H" titre of 1/150 and two rabbit sera contained "H" antibodies at a titre equal to 100 per cent. and 70 per cent. of the corresponding "O" titre after inoculation with a formolized suspension of a *Salm. typhi* 901-O strain, though this strain was still apparently adequate for the preparation of "O" suspensions. Even an alcoholized inoculum of such a strain was followed by the appearance of "H" antibody to 10 per cent. of the "O" titre, and similar results followed the use of formolized cholera "O" variants *in vivo*. On the other hand, an optimally maintained strain of *Salm. typhi* 901-O (kindly supplied by Dr. A. Felix, F.R.S.), though eventually acquiring motility as described above, evoked no trace of "H" antibody when directly sub-cultured to either broth or agar and used as an inoculum for rabbits, even after five doses of broth or of a saline wash from the agar.

In general, "O" variants seem to behave as though the "O" (non-flagellate) form is dominant, but a small minority of recessive "H" (flagellate) organisms normally continue to be produced. (A similar dominance of phase 2 has been postulated (Archer, 1938) in respect of salmonella phase 2 ("group") variants.) The excess of dominant "O" forms after growth under ordinary conditions will, on this hypothesis, always be such as to satisfy the second and third criteria quoted, but the recessive "H" forms which develop can spread in soft agar owing to their motility and hence be selectively isolated. If an "O" isolation is merely the result of an adaptation to environment, spread on soft agar should be rapid and uninterrupted, but "O" variation may be manifest by complete or local stoppage of spread and a clear-cut growth margin. The resumption of such arrested spread has been noted, with the production of a target-like growth effect on the plate. Enough recessive "H" forms may develop in simple cultures of an "O" variant to stimulate "H" antibody production *in vivo*.

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Strains which fulfil the four requirements of Hayes and Freeman may be encountered. One is described in an early account of two carriers from our laboratory (Archer *et al.*, 1950), and Hayes and Freeman described two themselves (one *Salm. paratyphi A* and one *Salm. paratyphi C*). Our strain was, however, completely rough and degraded. Theirs would seem to be true mutants, but, unless actual development from a flagellate precursor has been studied, the alternative, that such an apparent mutant is a distinct aflagellate species, must be considered.

Isolations from Carriers

As might then be expected, strains lacking "H" antigens may be isolated from the urine of carriers. Nine of the eighteen *Salm. typhi* strains here considered showed this characteristic to some degree; of these, five also showed a tendency to roughness; six smooth strains of *Salm. paratyphi A* and four strains of *Salm. paratyphi C* (of which one tended to roughness) also showed this defect. (Certain rough *Salm. paratyphi A* strains may also have been primarily aflagellate, but this was not definitely shown. When dealing with such auto-agglutinable strains it was not easy to show an antigen lack without manipulations which of themselves might induce the development of flagella.) Some of such organisms readily become flagellate, while flagellate suspensions of others may be produced with more or less difficulty by the use of soft agar with subculture to similar media or to broth after spread, or by the direct preparation of suspensions by breaking up a soft agar spreading culture in saline and filtering through paper (Archer, 1941). It was thought that the latter method might be useful if reversion of sub-cultures to the "O" form were very rapid, or where spread had started and then stopped. It is often successful, but the necessity for it was not positively demonstrated during this work. Even *Salm. typhi* 901-O did not tend to revert to the "O" form once flagellate growth was induced. This was unexpected and is difficult to reconcile with a theory of "O" dominance in the strain.

Salm. typhi strains lacking "H" antigen

One smooth strain yielded "H"-agglutinable cultures from soft agar; there is no complete record of the other three and of one rough strain.

Another rough strain became "H"-agglutinable in soft agar. The remaining three rough strains at first failed to spread in it. Of these strain No. 20 twice failed to spread when first isolated; when tested from a later specimen it did spread; later still both the large and dwarf colony forms previously described failed to do so. Finally, seven of a number of cultures from carrier No. 20, made before starting hexamine treatment (Archer and Naylor, 1952), were inoculated into Craigie tubes. Flagellar antigen *d* could not be demonstrated from four of them after two, nine, ten and thirteen days respectively, but was found in the remaining three cultures after two, three and eight days respectively.

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One strain (No. 10) which has not been included in this category (since on first isolation and on most other occasions the "H" antigen was present) was also re-isolated repeatedly before hexamine treatment of the patient. Cultures isolated from eight specimens were inoculated into Craigie tubes. Three of these showed no flagellar antigen after three, four and five days respectively.

Salm. paratyphi A strains lacking "H" antigen

Six smooth strains and one rough lacked "H" antigen on primary isolation. One of these smooth strains (No. 14) also showed anaerogenic tendencies. As with *Salm. typhi*, one strain of *Salm. paratyphi A* (No. 9), which is not included in the "H"-deficient category since it was flagellate on first isolation, was later frequently isolated as a prelude to treatment of the carrier. Two of eleven Craigie tube cultures took five and six days respectively before "H" antigen *a* was demonstrable. It is also of interest that, though this strain was anaerogenic on first isolation, these pre-treatment cultures produced gas regularly in MacConkey-mannite and in the appropriate peptone water "sugars."

Salm. paratyphi C strains lacking "H" antigen

Three smooth strains of *Salm. paratyphi C* were not "H"-agglutinable on isolation. Strain No. 6 (rough) would not spread in soft agar after first isolation. Cultures from two further urine specimens from this carrier were agglutinable by "H" serum. Two still later isolations each required passage of the supernatent of rough broth cultures through soft agar three times before antigen *c* could be demonstrated.

This series therefore shows, in general, little more than might be attributed to adaptation, though *Salm. typhi* strain No. 20 and *Salm. paratyphi C* strain No. 6 showed some evidence of a tendency to genuine "O" variation, as did, to a less degree, two other rough typhoid strains.

The influence of "H" antibodies in vivo

The effect of "H" antisera in inducing "O" growth *in vitro* is recognized and counteracted by soft agar in methods used to induce phasic variation (Archer, 1941).

Hayes and Freeman speculate on the possibility of an apparently unstable phasic variant of one of their strains of *Salm. paratyphi A* being due to "H" antibodies in the patient's blood. That this might be a determining factor for flagellar absence both *in vitro* and *in vivo* on isolation from inoculated persons had occurred to me with regard to "O" cultures isolated in 1933 from two cases of typhoid fever. Both these strains became "H"-agglutinable in soft agar, but both tended to revert to "O" later.

At that time tests were made on the effect of homologous "H" antibody on living flagellate *Salm. typhi* either growing in blood-bile and blood-taurocholate mixtures, or when injected intravenously into immunized rabbits. The blood mixtures were also titrated. Evidence on induced loss of "H" antigen was

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inconclusive. Apparent damage to "H" antibody was noted in some, but not in all, preparations of both types of blood mixture. These experiments were, however, unsatisfactory in that both "H" and "O" antibodies were present in the immunized rabbits, a standard strain was not used as the living inoculum, and blood cultures from the rabbits were all in fluid medium.

Infection of immunized Rabbits and Mice

Further experiments using rabbits and mice immunized with *Salm. muenchen* to produce "H" but not "O" antibody for *Salm. typhi*, and a living inoculum consisting of a suspension of *Salm. typhi* 901-H (intravenously to rabbits and intraperitoneally to mice) were carried out. Rabbits were bled and mice killed at intervals. Cultures of rabbits' blood were made at approximately 1/10 dilution in 2 per cent. taurocholate solution, and in glucose broth, by adding 1.0 ml. blood to 9.0 ml. of each medium. Blood was also plated direct on agar and MacConkey. The blood titre of each immunized rabbit had been determined before the living dose was given and the titre of a number of rabbits' blood cultures was tested. Cultures of mouse heart-blood and peritoneal washings were made on agar and MacConkey. Blood was pooled from each immunized batch for estimation of its average titre.

Results: Rabbits.—1. Blood cultures from only one of four immunized rabbits were found to be positive. This animal had a titre of 1/2500 for flagellar antigen *d* and had received a dose of 1,000 million living *Salm. typhi*. The other animals had received 1, 10, and 100 million *Salm. typhi* respectively. The positive cultures were that in glucose broth made four hours, and those in both glucose and taurocholate made seven hours, after the living dose, sub-cultures from these gave a growth after one, three and five days' incubation respectively. All were "H"-agglutinable.

2. All other cultures (made four, seven, 24 and 48 hours after inoculation) were negative. Hence 2 ml. of blood contained no *Salm. typhi* four hours after doses of 1, 10 and 100 million. A dose of 1,000 million yielded no *Salm. typhi* from drops of blood on direct plates four hours after, and none from 2 ml. blood 24 hours after, it was injected.

3. Culture titres indicated little loss of "H" antibody in either medium after one to seven days in 12 of 14 tests. Of the remaining two, one showed early loss of more than two-thirds of the "H" antibody in sterile taurocholate, and the other a four-fifths fall after seven days in a positive glucose culture. "O" (muenchen) titres were $<1/10$ in taurocholate (indicating that less than one-fifth antibody remained), while all, two-fifths, and less than one-fifth of the added "O" antibody was present in three glucose broth cultures, after five to seven days.

Mice.—Batches of eight immunized mice received 5, 20 or 100 million living *Salm. typhi* 901-H and uninoculated control mice received 5 or 100 million, intraperitoneally, two immunized mice at each dose being killed after five, 24 or 48 hours. After five or 24 hours, two control mice were also killed.

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After five hours: (i) Blood showed scanty to numerous organisms and the peritoneal washings a moderate to heavy growth. Fifteen heart-blood colonies from immunized animals and 15 from controls were inoculated to broth; all were "H"-agglutinable. Nine colonies from immunized animals were subcultured to agar; saline suspensions of all were "H." Growth on six original plates from immunized animals was washed off and the suspensions tested directly with "H" antiserum; all showed partial agglutination, though one only to a slight degree. The plates from the peritoneal washings were also washed off; the suspensions produced were all "H"-agglutinable. (ii) "H" titre of the blood-pool was 1/125.

After 24 *hours:* (i) Blood was almost cleared; only three colonies in all, from two of six immunized mice, were present on plates. All produced "H" suspensions after subculture to solid media and wash-off. Peritoneal growth was much reduced in these six cases. Broth and agar subcultures, and plate washings, were all "H." (ii) "H" blood-pool titres (two pools) were 1/1,000 and 1/500 tr.

After 48 *hours:* (i) Blood was negative in all six immunized mice; peritoneum was negative in three cases, the remaining three yielding a total of seven colonies. Five subcultured were "H." Two plate washes made after spreading from the colonies were only poorly agglutinated by "H" antiserum. (ii) "H" blood-pool titres (two pools) were 1/250 for each.

Clearance of Infection.—The blood of mice surviving intraperitoneal injection of 5-100 million *Salm. typhi* 901-H was generally cleared in 24 hours and invariably cleared in 48 hours. The peritoneum was almost totally cleared in 48 hours.

Comment.—No evidence of impressed "O" variation and little or none of "O" adaptation owing to "H" antibody in the host was obtained by experiments on rabbits and mice. In both groups of animals the blood was so rapidly cleared of living organisms as to offer no fair comparison with a human infection. "H" antibody does not appear to be damaged by sodium taurocholate in 2 per cent. solution. The possibility remains that in urinary carriers who are also excreting urinary antibodies these may play a part in producing an adaptative loss of "H" antibody or even an impressed variation. No support is afforded to this possibility, however, by *Salm. typhi* strain No. 17, which was "H"-agglutinable on two occasions when "H" antibody was present at titres of 1/10 tr. and 1/20 tr. in the urine from which isolation was made.

Roughness and Virulence

Roughness of strains of *Salm. typhi* passed by urinary carriers has been described by Dunbar (1948), and the roughness and low virulence of a presumed strain of *Salm. typhi* and the roughness of a *Salm. paratyphi C* strain by Archer *et al.* (1950) in previous reports from this laboratory. Indeed, it later came about that rough growth of an organism from urine would suggest to us that it was

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probably a member of the enteric group. The number of strains showing some degree of a rough tendency among those here under consideration was 9 *Salm. typhi*, 9 *Salm. paratyphi A* and 2 *Salm. paratyphi C.*

For some time a discrepancy between native carrier incidence and military case incidence for different enteric species has been noticed. The first is illustrated by the respective numbers of the different species among the strains in this series and by the carriers found in 1949-1950, which were 31 T, 35 A, 1 B, and 25 C. Case incidence was 32 T, 15 A, 17 B, and 1 C in the latter year. The number of cases may well, of course, be a misleading index of the number of sources of infection as one such source may produce single or many cases, depending upon the circumstances involved (e.g., contamination of food consumed by one or many). Five of the paratyphoid A cases and 10 paratyphoid B cases among those quoted above appear, in fact, to have represented single *incidents*. Nevertheless the extreme rarity of para B carriers (while cases occur) and of para C cases (while carriers abound) needs explaining. Possible causes might include a low incidence of paratyphoid C fever because the carriers have been eliminated by discovery ; by contrast, the very failure to discover excretors of *Salm. paratyphi B* could result in infections occurring due to their undetected presence. Such a difference in success in screening might in turn be due to general chronicity (hence easy detection) of *Salm. paratyphi C* excretors and a high proportion of transient or intermittent urinary carriers, or even a predominance of fæcal carriage, of *Salm. paratyphi B.* In the latter connection the possible roll of *Salm. paratyphi B* as a cause of gastroenteritis rather than of enteric fever merits consideration since, when the latter has occurred, urinary excretion during convalescence apparently follows in 3.4 per cent. of patients—only slightly less often than it does in typhoid fever (Vogelsang and Boe, 1948). The paratyphoid B problem needs further investigation. With regard to *Salm. paratyphi C*, the follow-up tests recorded in the second paper of this series do not suggest a general chronicity among carriers of this species, and other possibilities are that low virulence of *Salm. paratyphi C* excreted in urine is the rule and that an excretor of an avirulent strain may present no risk as a source of infection. *Salm. typhi* also, however, often appeared degraded in carrier urine and certain strains have been found intractably rough.

It thus seems of some importance to determine the degree of degeneration and loss of virulence in carrier strains ; the proportion of excretors of avirulent organisms among carriers ; and the regularity with which the organisms passed by individuals among them are avirulent. Findings for this series of strains is given in Table I (the figures for rough cultures are minimal as the recording of rough growth may at times have been omitted) ; the numbers of organisms, and proportion of rough cultures, passed by different carriers are shown in Table II, and the virulence of certain strains in Table III.

In general, roughness was more often found in strains of *Salm. typhi* than in paratyphoid strains. Though marked roughness at all times of observed excretion was found in one typhoid and one paratyphoid A strain, lesser degrees of

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roughness, and the isolation of the same strain from its carrier sometimes in a rough and sometimes in a relatively smooth condition, seem more common. Fully virulent strains of *Salm. typhi* and *Salm. paratyphi A* were met. *Salm. typhi* was more often found excreted in very large numbers than was *Salm. paratyphi A*. There seem to be no grounds for general disregard of excretors of rough organisms as harmless carriers ; nor, though Findlay (1951) has shown agreement between mouse-virulence of strains and the severity of the disease caused by them in human outbreaks, can we be sure that strains of low mouse-virulence cannot, particularly in large doses, infect man and their virulence perhaps be enchanced in him. Indeed, analogous evidence in favour of the ability of apparently degraded enteric strains to produce true and severe infections is afforded by a recent test in which intraperitoneal doses of approximately 1,000 *Salm. paratyphi C* from an apparently very rough culture killed 11/24 mice in from eleven to fifteen days. Further examination of the *Salm paratyphi C* strain (an old one) showed that roughness was by no means complete and the organism was recovered in a smooth state from the spleens of the five dead animals examined *post mortem*.

Table I.—Incidence of Rough Strains and Rough Cultures

Species	Proportion of Strains showing Rough Tendency		Frequency of incidence of Rough Cultures of Strains which were repeatedly isolated (*R*/total and *r*/total. *R*=very rough ; *r*=slightly rough) [Also proportion of cultures of *Salm. typhi* tested for the presence of the Vi antigen which were found to contain it.]
	All isolated Strains (*R*/total)	Strains which were repeatedly isolated (*R*/total)	
Salm. typhi	9/18 (1)	6/9 (1)	Strain No. 1 · No. 2 · No. 4 · No. 10 · No. 17 *R* 10/19 · 8/23 · 8/19 · 10/25 · 5/5 *r* 1/19 · 2/23 · 2/19 · 3/25 {Vi agglutination+/No. of tests Strain No. 1 · No. 2 · No. 4 · No. 10 2/5 · 5/7 · 6/11 · 10/11}
Salm. paratyphi A	9/29 (2)	2/10 (3)	Strain No. 5 · Strain No. 51 *R* 4/16 · 8/8
Salm. paratyphi C	2/10	1/2	Strain No. 6 *R* 5/6

(1) The totals of 18 and 9 contain Strain No. 13, *not* included in the number shown as having a rough tendency but which produced a rough culture once out of 11 tests (see also under "virulence" and "numbers excreted").

(2) One strain omitted owing to insufficient record.

(3) The total of 10 includes two strains which produced smooth growth on each of the only two and three occasions when cultures were positive.

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TABLE II.—PROPORTION OF ROUGH ISOLATIONS FROM CASES AND NUMBERS OF ORGANISMS EXCRETED BY THEM

Species	Strain	Frequency of Rough Cultures (Sum of *R* and *r* in Table I)	Numbers Excreted: No. of Counts	Numbers Excreted: Range
Salm. typhi	1	11/19	2	20,000—23,000
	2	10/23	3	1,500,000—20,000,000
	4	10/19	3	50,000—1,000,000
	10	13/25	2	5,000—160,000
	13	1/11	1	2,000,000
Salm. paratyphi A	5	4/16	1	68,000
	9	0/70	2	700—1,700,000
	12	0/54	1	500,000 (1)
	18	0/16	2	200,000—400,000
	19	0/43	5	1,000—50,000
	21	0/26	4	21,000—2,000,000

(1) An intermittent carrier showing evidence of very wide variation in numbers excreted.

TABLE III.—ROUGHNESS AND VIRULENCE

Species (normal A.L.D. (L.D.50) and M.L.D. (L.D.100) for mice)	Strain	Rough Tendency (*R*/total cultures)	Virulence for Mice — Critical Doses — Lower: Dose*	Lower: Survivors, all Recipients	Higher: Dose*	Higher: Survivors, all Recipients	A.L.D.
			million		million		million
Salm. typhi	13	1/11	100	5/10	200	0/10	100
(L.D.100 : 75 mill., L.D.50 : 50 mill.)	17	5/5	100	10/10	200	2/10	>100 <200
	20	(Frequently rough)			400	14/16 8 mice each, for "Large" and "Dwarf" types. 2 inoculated with "Large" died.	>400
	31	Single isolation : Smooth	50	5/10	100	3/10	50
	32	Single isolation : Rough			200	8/10	>200
Salm. paratyphi A	9	0/70	150	4/10	300	2/10	150
(L.D.100 : 250 mill.)	12	0/54	150	5/10	300	1/10	150
	21	0/26	300	1/6	600	0/6	<300
		Controls: *Salm. typhi* Ty 2	50	3/6	100	0/6	50
		Controls: *Salm. paratyphi A*	150	4/6	300	1/6	<300

* As determined by Brown's opacity tubes.

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Notes on Table III

1. *Dosage.*—Virulence testing in mice was carried out by intraperitoneal injection of a suspension of growth on agar. The number of mice was too small for an accurate determination of the L.D.50, but results satisfactorily demonstrated either approximation to, or gross variation from, the normal. Dosage was determined by an opacity count using Brown's tubes. It is now commonly held that true counts are generally about twice those obtained by the use of Brown's tubes and tables. The doses here recorded, however, were checked by viable counts using drops of serial dilutions on plates.

Findings include the following :

Salm. typhi	Strain 13, Strain 31 } opacity and viable count agreed to within 5 per cent.
	Strain 20 (Large), opacity 133 per cent. of viable count.
Salm. paratyphi A	Strain 9, opacity 75 per cent. of viable count.
	Strain 12, opacity 66 per cent. of viable count.

In counts on strains 17, 20 (Dwarf) and 32 this viable check failed. This was attributed to roughness, to the degree of which failure seemed to be proportional. Strain 32—the roughest—was examined microscopically. Long forms were common and the deposit in a broth culture remained clumped after mixing by drawing in and out of a pipette thirty times. To try to demonstrate the effect of clumping on colony counts, some were made on the rough strain 17 and the very rough strain 32 before and after shaking up the suspensions with beads in an attempt to disperse such aggregations. No significant difference was found in the counts on strain 17 : that on strain 32 was four times greater after shaking than before.

2. *Correlation between Roughness and Virulence.*—*Salm. typhi* (strains 13, 17, 31 and 32). As might be expected, this correlation was close. The table shows an ascending A.L.D. of these strains in the order 31, 13, 17 and 32 : strain 31 was the smoothest, growing with little deposit in broth ; strain 13 was also smooth but showed some deposit in broth ; strain 17 grew with slight turbidity in broth and took over one hour to start clearing (without coarse flocculation) after shaking ; strain 32 grew as a deposit, the supernatent remaining clear. When this culture was shaken up it began to settle again with coarse flocculation in a few minutes.

Salm. paratyphi A: Though 30 per cent. of the strains showed a tendency to roughness (and strains 51 and 55 were so rough as gravely to hinder identification), the three strains whose virulence was tested were unfortunately all smooth.

Salm. paratyphi C: No virulence tests were carried out on the strains of this species under study. An A.L.D. of a rough strain was, however, reported as of the order of 400 million in an earlier paper (Archer *et al.*, 1950) and this was considered as low for the species. The determination of mouse-virulence for *Salm. paratyphi C* is complicated, however, by the fact that, as Kauffmann (1936) has shown, this species is capable of setting up a true infection in mice so that quite small doses (1,000–10,000 organisms) may prove fatal in five to twelve days. He also demonstrated that with very high dosage (500 million organisms) rapid death is produced (as by the other enteric group species), but it is not possible from his figures to estimate an A.L.D. for this rapid (?toxic) killing effect. Quick death was all that was noted in respect of the rough strain referred to above. Recent observations suggest, however, that the rapid death (within 72 hours) mouse L.D.100 of *Salm. paratyphi C* is approximately 200 million organisms and the L.D.50 (A.L.D.) 100 million organisms, hence the earlier recorded A.L.D. of 400 million for the rough strain is probably correctly considered as indicating low toxicity, though no deduction can be drawn as to the invasiveness of that strain since observation was not sufficiently prolonged, and doses below 100 million were not used.

3. *Degrees of Roughness.*—The greater instability of *Salm. typhi* strain 32 than of strain 17 in broth suspensions and the marked roughness of *Salm. paratyphi A* strains 51 and 55 have already been mentioned. Other evidence of marked loss of the smooth somatic antigen is afforded by the record of sub-cultures necessary before suspensions became sufficiently stable for agglutination tests to be performed. Thus, using serial cultures in broth, plates and Craigie tubes, results with four strains were as follows :

Salm. typhi

After isolation of strain 54, five serial broth cultures were needed before one was stable enough to test.

After one of the isolations of strain 17	4 broths, 3 Craigie tubes and 2 plates	were used before sufficient stability for an "H" antigen test, even in 0.45% NaCl, was reached.
Salm. paratyphi A		
With a sub-culture after isolation of strain 34	6 broths, 3 Craigie tubes and one plate	
After one isolation of strain 51	6 broths, 3 Craigie tubes and 2 plates	

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Summary and Conclusions

1. Lack of flagellar antigen and rough change among 58 enteric group strains isolated from urinary carriers in Egypt, and the virulence for mice of eight of the strains (5 *Salm. typhi* and 3 *Salm. paratyphi A*), is recorded.

2. Nineteen of these strains were found on occasion without flagella. In two of them there was some evidence that the strain showed dominant variation to the aflagellate form. Tests on rabbits and mice gave no evidence that "O" adaptation or variation may be impressed by pre-formed antibody *in vivo*. Though this at first seems surprising, being against experience *in vitro*, absence of signs of multiplication with, on the contrary, rapid elimination of the injected organisms suggests that the tests were inadequate as an index of what might occur in human infections.

3. Twenty of the strains were isolated rough on one or more occasions. Both fully mouse-virulent and apparently completely degraded strains were met, but degradation, when present, was more commonly incomplete, and individuals produced cultures at different times that were unlike in the apparent extent to which the organisms were degraded. The numbers of times on which a strain was found rough or smooth when isolated from different specimens from an individual may have depended upon the state of all (or at least the great majority) of the organisms in each such specimen or, perhaps more probably, have been mainly the result of chance when picking colonies from plates. If chance were the chief cause of the differences noted, they will have arisen from the random picking of either rough or smooth colonies from plates on which both were always present in a similar ratio, the plates having been inoculated with urine specimens containing rough and smooth organisms in relatively constant, rather than widely differing, proportions.

In either case the ratio of rough to smooth cultures found should afford an indication of the over-all degree of strain degadation. The degree of its fluctuation from specimen to specimen, however, remains to be assessed. In the present state of our knowledge many tests would be needed to prove degradation complete and we cannot ignore, as harmless, the excretor whose organism is found to be rough on routine screening.

No adequate explanation for the low incidence of Service cases of paratyphoid C fever in the Canal Zone of Egypt, in spite of the presence of *Salm. paratyphi C* carriers, is put forward. It does not appear to be due to carrier strains of this species generally degraded.

Acknowledgments

I thank my colleagues of the Central Medical Laboratory, M.E.L.F., for their help and advice, and Major-General A. J. Beveridge, *O.B.E.*, *M.C.*, Q.H.P., D.M.S., M.E.L.F., for advice and for permission to publish this work.

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NON-OPAQUE FLOATING GALL-STONES AND THEIR RADIOLOGICAL DEMONSTRATION

BY

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INTRODUCTION

This article may well begin with a quotation from Kerley's (1950) chapter on the Biliary Tract in "British Authors" : "There are an increasing number of reports of floating gall-stones, i.e., small stones floating on top of concentrated bile, and it seems likely that with routine hospital technique these stones are being overlooked and the gall-bladders passed as normal." The literature is very scant on the subject. Brailsford described the condition in an article in the *British Journal of Surgery* in 1938, when he observed : "In the routine cholecystographic examination it is advisable to take one or more of the serial radiographs with the patient in the *erect* position, for this will sometimes bring out features which may be unrevealed or unsuspected from the radiographs taken in the prone position." (The italics are mine.)

COMPOSITION OF GALL-STONES

Gall-stones usually consist of differing amounts of bile salts, cholesterol, and calcium salts. When there is bilirubin-calcium present, the stones will be opaque. In its absence, or, in other words, when they are composed wholly of cholesterol, the stones will be non-opaque. It is with these latter stones that we are concerned.

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They may be sometimes visualized as negative shadows, but this is a hazardous radiological decision, owing to the presence of numerous shadows due to gas in the gall-bladder region.

Technique

A preliminary film is taken on the patient's admission to hospital. If opaque stones are seen, this finishes the radiological examination. If not, the patient is given a last meal at 1800 hours on the night previous to the examination. It has been suggested recently that this last meal should be a fatty one, in order to empty the gall-bladder and so avoid dilution of the dye, but I have no experience of this method. At 1900 hours on the same evening the patient is given 4-6 g. of pheniodol in powder form in water. The amount given is varied with the bulk of the patient. On the following morning at 1000 hours a scout film is taken to determine the position of the gall-bladder. This and the preliminary film should preferably have the dimensions of 17/15 inches owing to the great variation of the position of the gall-bladder. I have recently seen a gall-bladder which changed from a position opposite the right transverse process of L.V.2 to the lower part of the R. sacro-iliac joint on the patient's assuming the erect position. When the position of the gall-bladder has been determined, the patient is screened in the erect position, and a film series taken, with pressure if necessary. The patient then returns to the ward, where a fatty meal, preferably of milk and eggs, is taken, after which he returns to the X-Ray Department for a final picture and screening, if necessary.

Radiographic Desiderata

1. High milliamperage.
2. Low kilovoltage.
3. Short exposure—speed is absolutely essential.
4. Potter-Bucky diaphragm, synchronized with the exposure, to give fine detail.
5. Rotating anode tube with a fine focus, if possible.
6. Prone and erect positions.

Mechanism of Floating Gall-stones

There would appear to be two theories on what causes these stones to float:

(1) The bile consists of layers of different specific gravities, both bile and mucus, and the stones take up an intermediate position, floating on a layer of a higher specific gravity than their own.

(2) The phenomenon is a direct result of the test itself and the layering is due to the admixture of the dye with the bile. It is said that the specific gravity of the bile itself is 1010–40, and that of the lightest cholesterol stone 1040. The stones, therefore, only become suspended due to the artificial increase of the specific gravity of the contents of the gall-bladder by the dye. (Schinz, Baensch and Friedl, 1939.)

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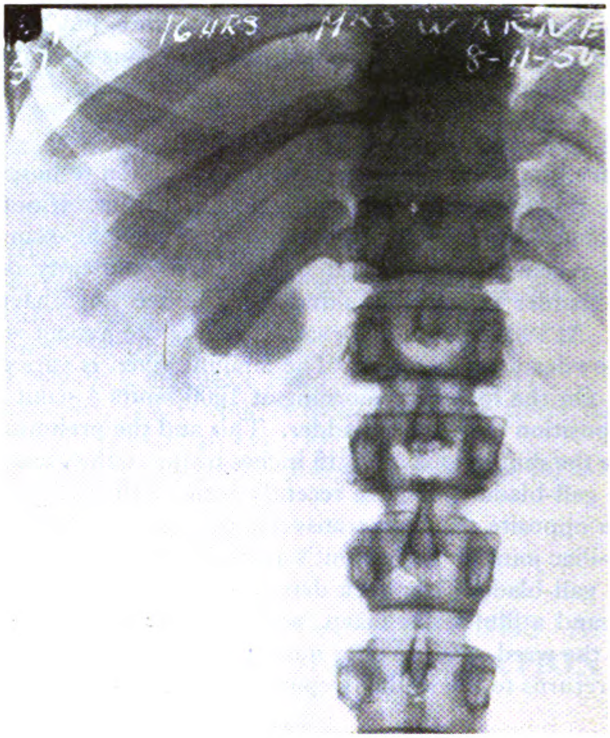

Fig. 1

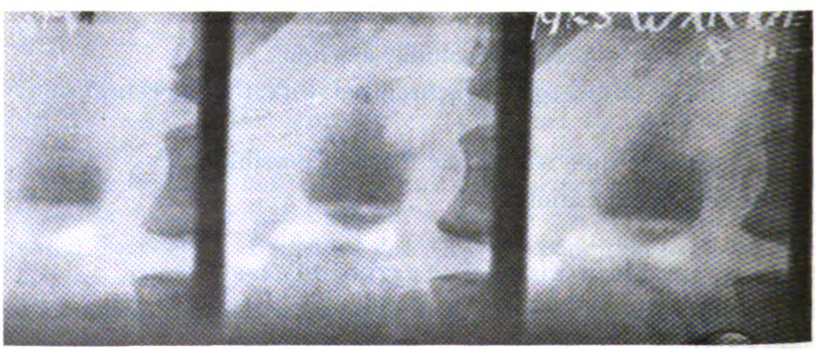

Fig. 2

Radiological Signs and Two Cases

The line of floating stones appears as a well-defined horizontal band of linear translucency running across the gall-bladder at a level dependent upon the relative amounts of bile of different specific gravities. In Case 1 it was actually possible to see the line of stones fluoroscopically, when the effect was quite striking.

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FIG. 3

Case 1.—Female, aged 36, married, admitted on 4/11/50 with abdominal pain, coming on in half-hourly attacks. Pain like bearing-down pain. Similar attacks three and six months previously. Vomited. Temperature 97.6° F., pulse 100. Tongue coated.

O.E.—No distension of abdomen. Vague, slight tenderness in R.I.F. On 6/11/50 patient developed pain in R. scapular and hypochondriac areas and there was slight jaundice. After numerous routine biochemical tests, the patient was sent for cholecystography on 12/2/51, and the X-ray report dated 13/2/51 read : "A case of floating gall-stones, probably cholesterol in composition."

Figs. 1–3 illustrate graphically the result of the cholecystography. Fig. 1 shows the ordinary routine 16-hour film taken in the prone position. The gall-bladder, spherical in type, is situated directly behind the right twelfth rib, and looks absolutely normal, not alone with regard to size, shape, position, and absence of any extraneous shadows, but also in the concentration of the dye. (In fact, the wet film looked so normal that it was only with reluctance that I screened the patient.) Figs. 2 and 3 show the result of the latter, and the resultant film series taken in the erect position. The horizontal band of linear translucency is clearly visible. As this line coincided with the arc of a semi-circular gas shadow, it was decided to take another picture after an hour. This put the diagnosis beyond doubt, as shown in Fig. 3. It also shows quite clearly that the floating stones had risen quite perceptibly in that time, presumably due to an increase in the amount of higher specific gravity bile.

The patient had a cholecystectomy done on 24/2/51. The gall-bladder was normal in size and contained numerous small yellow stones. They were cholesterol in composition. The mucusa of the gall-bladder showed infiltration with chronic inflammatory cells.

The patient made an uneventful recovery.

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FIG. 4

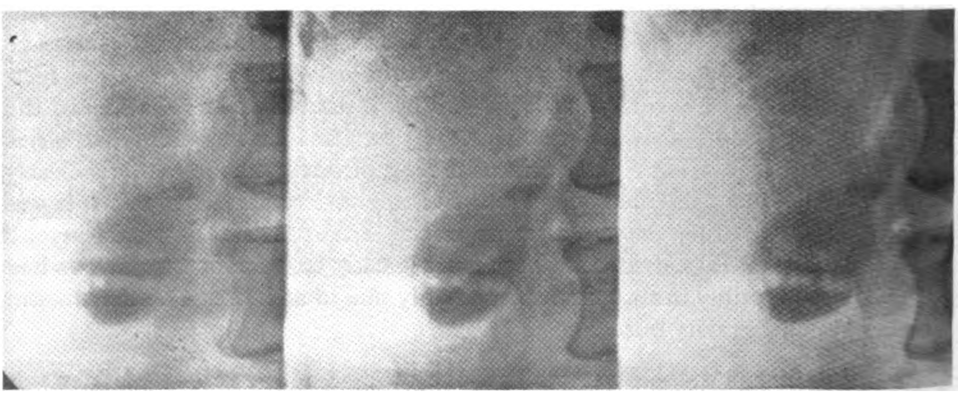

FIG. 5

Case 2.—Female, aged 48, admitted on 7/3/51 with a history of two acute episodes of epigastric pain in August, 1950, and January, 1951, with periods of flatulent dyspepsia and epigastric discomfort in between. She was a short, fat,

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rather nervous woman of pasty complexion, with a history of a hysterectomy in 1944. Examination revealed tenderness in the epigastrium in the mid-line and to the left of it. She was sent for a barium meal examination on 12/3/51 with negative results. On 15/3/51 she complained of something pressing on the front of her neck, but a barium swallow revealed nothing abnormal.

She was eventually sent for cholecystographic examination on 5/4/51, and the report was: "This is a case of floating gall-stones, probably non-opaque cholesterol stones."

Figs. 4 and 5 illustrate the results of the cholecystography. Fig. 4 is the routine 16-hour film taken in the prone position. It shows an ovoid, normal-sized gall-bladder lying well out in the right hypochondrium behind the eleventh right rib. There is a considerable collection of gas in the hepatic flexure, which would make the diagnosis of any irregular negative shadows as gall-stones very dubious. Fig. 5 shows a series taken in the erect position, which again places the diagnosis outside the realms of doubt.

A cholecystectomy was carried out on 13/4/51. The gall-bladder was found thickened and bound down to the duodenum by massive adhesions. The gall-bladder itself was found full of stones, immersed in thick bile, yellow in colour, and consisting mainly of cholesterol. In fact, they were exactly similar to those in Case 1, except for size, and this was merely a mechanical phenomenon, as the larger types of stones in this case were merely accretions of smaller stones.

The patient made an uneventful recovery and was discharged fit on 26/4/51.

Summary

1. A short account of "Floating gall-stones" has been given.
2. Two cases are described.
3. A plea is made for the most careful technique, in order that these cases may not be missed.

My thanks are due to Colonel G. W. B. Shaw, A.D.M.S., for permission to forward this article.

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THE TREATMENT OF GROUP A STREPTOCOCCAL TONSILLITIS

BY

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THE treatment of streptococcal tonsillitis is still controversial. It is doubtful which drug is most effective. Whether the incidence of complications such as rheumatic fever is related to the length and severity of the clinical infection is uncertain.

Sulphonamides were noted by Wilson (1944) to be of no obvious benefit in the treatment of group A streptococcal tonsillitis occurring in a food-borne outbreak. A controlled trial was not undertaken.

The Commission on Acute Respiratory Diseases (1945) quoted six papers which gave conflicting evidence on the value of sulphonamides, and concluded that, although sulphadiazine had some beneficial action on the clinical signs in this illness, yet there was no significant therapeutic effect. Their results were based on a carefully controlled trial. From 91 of their 108 cases *β-hæmolytic streptococci* were isolated. They suggested that their results were open to criticism on account of the unequal distribution, among treated and untreated groups, of those who had had previous tonsillectomy.

Anderson (1949) expressed the opinion that sulphonamides were of no proved value in the treatment of "Sore Throat," and later Landsman *et al.* (1951) undertook a confirmatory trial of the treatment of this condition in general practice. His results coincided with a report on the value of sulphonamides in acute tonsillitis by MacDonald and Watson (1951).

As a leading article in the *British Medical Journal* (1951) pointed out, the results obtained by these two groups were open to criticism on several points, not least of which concerns the inclusion in both trials of some 45 per cent. of cases in which the bacteriological cause was not defined. In fact, as the article stated, the main evidence of Landsman *et al.* for assuming the inefficacy of sulphonamides in the treatment of "Sore Throat" rested on the results obtained in the group of 15 cases from whom *β-hæmolytic streptococci* were isolated and to whom sulphatriad was administered. In the same treatment group were 21 control cases.

β-hæmolytic streptococci were grown from only 42 of the 82 cases of tonsillitis reviewed by MacDonald and Watson (1951). They concluded that there was no significant difference between those treated with sulphonamides and those untreated, although they subsequently stated that the Medical Officer in charge

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of the cases was able to detect a difference, and that an assessment of cure at seventy-two hours was significantly associated with the use of sulphonamides.

The Present Trial

In an endeavour to avoid some of the difficulties encountered by Landsman *et al.*, and by MacDonald and Watson, and to repeat the methods adopted by the Commission, advantage was taken of a further recent outbreak of food-borne group A streptococcal tonsillitis to carry out a controlled trial of the comparative value of penicillin and sulphamezathine. The epidemic, of 265 cases, has already been described (Gardner, 1952).

Those cases examined during the initial twelve hours of the outbreak included 102 men, each of whom had severe tonsillitis or pharyngitis, with enlargement of the tonsillar glands, temperatures of 100° F. and above, and considerable systemic disturbance. In each case infection had occurred by the same route and under similar circumstances. The mean age of the patients was 19.4 years. All had been in good general health.

Although the nature of the epidemic made difficult the strict observation of cases, yet it was possible to be certain of comparing groups of closely similar patients.

Methods of Treatment

For the purposes of the trial, the 102 cases were divided at random into three groups. The first 34 were treated with saline gargles, and aspirin, gr. 10, by mouth every six hours. The second group received sulphamezathine, g. 2 at once, followed by g. 1 every six hours. The final group was treated with penicillin, one injection of a procaine- and sodium-salt mixture being given once daily in a dose of 400,000 units. After two days this was superseded by one daily injection of 1 Mega unit of soluble penicillin.

In order to eliminate unjustifiable prolongation of treatment, it was decided at the beginning of the trial that any case showing no response to therapy by the fifth day after admission should have the (supposed) benefit of penicillin.

Results

To compare the value of various methods of treatment in tonsillitis is not easy, owing to the absence of any easily measurable end-point. The method adopted was to estimate the time taken for objective and subjective recovery, and for the fall of temperature to normal. The incidence of complications was also taken into consideration. The results were thus measured on the basis of the following four characteristics :

1. The time taken for the infection to subside, as determined by clinical examination.
2. The time elapsing until the patient again felt well.
3. The time taken for the temperature to fall to normal.
4. The incidence of complications of all kinds.

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TABLE 1.—TIME (IN DAYS) OF THE MEASURED RESPONSES

	1	2	3	*Number of complications*
(*a*) Gargle and aspirin group	6.41	5.85	4.20	6
Standard deviation ...	2.52	2.52	2.53	
(*b*) Sulpha group	4.05	3.85	2.38	5
Standard deviation ...	2.43	2.08	1.42	
(*c*) Penicillin-treated group	3.82	3.44	2.65	3

It will be observed that the differences between the means of Group (a) and Group (b) do not exceed twice the standard deviation of the former figures. Similarly, the differences between the means of Group (a) and Group (c), and between the means of Group (b) and Group (c), do not exceed, respectively, twice the standard deviation of the figures in Groups (a) and (b).

On the basis of these small groups, and in agreement with Landsman *et al.* and with MacDonald and Watson, it must therefore be concluded that there is no apparent advantage to be derived from treating group A streptococcal tonsillitis with sulphamezathine or with penicillin. In none of the three trial groups did the incidence of complications differ significantly.

DISCUSSION

It is doubtful whether this trial, and the others mentioned above, have answered the questions suggested by the opening paragraph. Although there is every indication that neither penicillin nor sulphonamides do much to shorten the course of what is frequently an illness of only four to seven days, we are uncertain whether these drugs may not do something towards preventing the late rheumatic complications by minimizing the antigenic stimulus of the streptococcal infection.

In future trials consideration should only be given to cases in which the causative organism has been defined. Estimations of the plasma streptolysin should probably be used to confirm specific infection. Investigations should be concerned principally with sporadic air-borne tonsillitis, since rheumatic sequelæ are uncommon after food-borne infections.

SUMMARY

1. The problem of how best to treat group A streptococcal tonsillitis is briefly reviewed.

2. The initial 102 cases of a food-borne epidemic are used in a comparative trial of penicillin and sulphamezathine.

3. The course of the infection is not significantly shortened by the use of either of these drugs.

4. It is felt that in future, trials of treatment in sporadic group A streptococcal tonsillitis should aim at determining the relationship between specific therapy and the incidence of late rheumatic complications.

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EXERCISE "MEDICAL RUBICON"
D.G.A.M.S. Annual Exercise, 1952

BY

Brigadier F. M. RICHARDSON, D.S.O., O.B.E., M.D.

THE subjects of this exercise were withdrawal and the assault crossing of a major river. The first choice was dictated by the subject of the War Office exercise "Cassius," and the Director-General made the second because he felt that it was time we turned from defence and withdrawal to the attack, and because he wanted to take advantage of our good luck in having Mytchett Lake on our doorstep at the Field Training School. Only a general account of the exercise is given here, and, as I did in my article on "Medical Mushroom," I would recommend you to read the detailed report which will be sent to those who attended the exercise, and to various units and H.Qs. (1).

A series of playlets and demonstrations dealt with the withdrawal at G.H.Q., Corps and Divisional level, and Lieut.-Colonel John Watts gave a thought-provoking lecture on surgical problems of withdrawal, which were amongst the points thrashed out in the interesting discussions.

When the curtain rose on the first playlet we realized that the Army Medical Directorate can claim at least one expert—Captain Alan Critchley, a make-up magician who had most beautifully disguised Colonel John Crosse for the part of General Predecessor, the D.M.S. of our Army Group ; and Scrooge's friends the Spirits of Christmas, abetting Captain Critchley, seemed to have transformed the colonel's cautious soul, as we listened to the generous provision which he expected the War Office to make for the medical order of battle of the army group. He was a dignified and attractive old character, poor Sammy Predecessor. Even his critics agreed that he was no fool. One felt that he was not thinking only of himself and of the bottom of page 3 of the Army List when he assured his D.D.M.S., Colonel John Douglas, that he was fully covered. But that saturnine if slightly sycophantic staff officer clearly began to "hae his doots"—Scots

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expression for "if the old man thinks he'll get away with all this he's nuts"—and soon the 'phone bell rang. It was the D.G. and from one end of the conversation we knew that the D.M.S. had come unstuck, and as soon as we met his relief, General Successor, we realized that we still had our old hard-headed Crosse to bear. Fortified by a personal letter from the D.G., who reminded him of the needs of other theatres, he proceeded, as directed, to prune Sammy's orbat. Clearly he agreed with Napoleon that if success in war could be attained without taking risks military glory would be at the disposal of very mediocre personality; and clearly he was no such personality as he strode over a large cloth model of most of Europe explaining his plan, with his D.D.M.S.—the same obliging Douglas—riding him on a cautious snaffle. The 'phone bell rang again, but this time the curtain beat it in a photo finish, and the Director-General, opening the discussion, asked the audience to decide which of the two D.M.Ss. they would have sacked.

This important and difficult stage of the exercise—pre-mobilization planning—was written and acted by these two experts. Lieut.-Colonel Ahern could never quite decide if it were "better SD" to refer to them as "the colonels John" or "the Colonel Johns." They had gravely doubted if so stodgy a subject could be made interesting. Colonel Douglas compared it to the checking of a laundry list. But the lively discussion was the reward of their hard work.

When in due course we met the D.M.S. again it was seen that neither general was considered to have got all the answers right. The D.M.S.—General Survivor was the name suggested for him by Colonel Walter Moursund—was none other than that cold, calculating character Douglas, who had presumably picked the brains of both and produced an acceptable compromise.

Many familiar actors from past stupendous productions at Mytchett appeared in the withdrawal playlets. About sixty inches of the 6 ft. 2½ in. of our star performer Staff-Sergeant Michael O'Sullivan were on view in startling nudity when he appeared in *lederhosen* as a F.S.S. sergeant disguised as a Bavarian waiter, with Major Jack Irvine in rouge and long blonde plaits as a ravishing Bavarian *madchen*. If this is not enough to make you all read the report, then the art of advertisement has no place in military training.

In the withdrawal demonstration we saw what a bulldozer could do for us in three hours' work, and we caught a glimpse of the Quartermaster, Captain Ted Gillard, as the chaplain, looking, as his Commandant said, more like a padre than any padre possibly could. The sort of treatment which a field ambulance company might have to undertake if cut off for several hours was being carried out and the casualties being embarked not only in storm boats and assault boats but on improvised rafts and floats, such as have been described in previous numbers of this Journal. (2) The simplest float of all was just a few bundles of hay or brushwood wrapped in a tarpaulin, which will remain buoyant for hours and can be used to take a cable across the river, or even to ferry casualties across in emergency. Some of the spectators were as surprised by the efficacy of this method as I was myself when it was first shown to me during the war. Yet those of us who had to read Xenophon's *Anabasis* at school should have known all

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about it, for it is related there how men of Cyrus' army crossed the Euphrates to forage for provisions. "They took the skins which they used to cover their tents and stuffed them with hay, then folded and sewed them up to keep the water from the hay." (3) The upholders of a classical education tell us that it is good brain training, but I must say that I wish they had not stuffed the *Anabasis* into me at a time when the sufferings, dissensions, and glories of the immortal Ten Thousand were merely a boring recital of stades and parasangs. The brilliant little portraits of those contrasting types of military leaders, Cyrus, Clearchus, and Proxenus, and Xenophon's unassuming, almost casual revelation of the development of his own outstanding qualities of leadership in difficult desert and mountain campaigning were quite lost on a preparatory schoolboy. Careful attention to Xenophon at a more receptive age might also have been of actual material advantage to me ; for had I read his advice on buying horses before I met a certain blarneying, horse-coping greenjacket I might have saved myself quite a lot of money and sweat.

Getting back to "Rubicon"—it was when we turned from the withdrawal to the river crossing that the significance of the title became plain. In 49 B.C. the Rubicon was the scene not of a major battle but of a political decision—it was a turning point. In any future war before we could mount an offensive involving the passage of a great river we should have to have tipped the balance of military power decisively in our favour. It would be a turning point and there would be no looking back. So in the exercise, having withdrawn behind our river line and got our breath back, our thoughts turned to the great day when we would attack and drive back the Saturnians behind their frontier.

We now saw the D.M.S. of the Army Group dictating to a garrulous Irish clerk—Staff-Sergeant O'Sullivan again reverted to private at his own request to evade further training with improvised floats which didn't—a directive to the medical services ordering them to begin training for river crossing operations. They were to start by studying the lessons of past campaigns ; and to the sound of "Soldiers of the Queen" the curtain rose on a very senior lady of the Army Nursing Service in Boer War days—Miss Honeysuckle. Into her sitting-room came the surgeon-general fresh from the trying experiences of the unsuccessful battle at the Modder river about which she keenly cross-examined him. Miss Honeysuckle, beautifully acted by Major Dorothy Hunt, was, except for four useful and decorative stenographers, the only contribution of the Q.A.R.A.N.C. to this year's exercise. They had no opportunity of explaining as they did last year how from C.C.S. level the work done by able-bodied R.A.M.C. nursing orderlies could be done much better by a slightly larger number of Grable-bodied Q.A.R.A.N.C. nursing orderlies. But Miss H. held high the standard, and showed that even in the last century, when they were still mere women, they liked to have a finger in the forward medical pie. With a few shrewd questions she revealed that the poor general's plan for the Modder battle, if indeed it could be called a plan, was most haphazard. He was quite glad to be recalled to action, and the scene closed with a little song, which our actors would I think agree could more justly be described as recitative with pianoforte continuo. As I knew that

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Major John Neal, the editor of this Journal, is a very keen historian I asked him to ferret out the facts for this playlet. He not only did this but wrote and acted in the playlet, which went with a swing and prepared the audience to endure a long lecture on river crossings in 1945—the Rhine and the Elbe—given by myself. The river crossing demonstration fully justified the D.G.'s faith in Mytchett Lake for aquatic sports, which was always much stronger than my own.

It was a high-light of the exercise to see our flotilla of stormboats, DUKWs, and a buffalo cruising about on the lake, the amphibians then beaching and driving past us into a field where the loads they could carry were demonstrated. The commentary during this demonstration was kindly given by Major J. A. G. Abraham, *M.C.*, O.C. 116 Amphibian Company, R.A.S.C., who had brought the amphibians and had given us invaluable help in laying on the demonstration. Whilst the audience were being given trips in the various craft and amphibians a crescendo of din was traced to a stormboat in which a party of airborne types headed by Colonel Graeme Warrack were apparently searching for some sort of sound barrier to break through.

On the last morning a discussion on the planning of major river crossings in the future was introduced by a dialogue between two officers who had been involved in the planning at 21 Army Group H.Q. for the Rhine Crossing—Colonel John Douglas and Lieut.-Colonel John Smith, who now commands 155 (Lowland) Field Ambulance, T.A. This was followed by an entrancing lecture on "The Medical Officer as a Prisoner of War," given by Major Alan Woolley. To be taken prisoner is a fate which every soldier must strive to avoid. Major Woolley showed us how for the doctor prisoner it can be made a rewarding and ennobling experience, because he alone can make an outstanding contribution not only to the physical but to the moral welfare of the prisoner community. You can read this most interesting lecture in the exercise report, and you will find it very well worth reading.

The last serial before the Director-General's closing address was presented by a team of Territorial Army officers captained by Brigadier Alan Crockford, and representing the R.M.O., the field ambulance, F.D.S., C.C.S., General Hospital, and A.D.M.Ss. of infantry and airborne divisions. Each briefly explained their problems in training and the kind of help they had received and hoped to receive from the regular army. After some of the points had been answered by A.M.D. representatives, the D.G. assured the team that the whole subject would be carefully and sympathetically examined. Indeed, although the opening of what the War Office calls a "BM," entitled "Territorial Training Troubles," may not exactly herald the millenium for the T.A., the regular R.A.M.C. will continue to do all they can to earn the kind things which Brigadier Crockford's Brains Trust said about them.

Compared with previous years many more officers attended with a much higher percentage of Territorial officers, and it was for that reason that the exercise was shorter and was held at a week-end. The extra numbers, of course, threw a bit of a strain on the Army School of Health, and we had to substitute a buffet supper for the usual exercise dinner. When these administrative problems

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threatened to get out of hand a source of great strength to the organizers was the cheerful imperturbability of Colonel Harold Knott, who refused to admit that anything was impossible for the Army School of Health.

The staging of the exercise was another triumph for Lieut.-Colonel Ahern and the Field Training School, whose hard work began many months before the exercise.

An account in the Journal of the D.G.'s exercise, a practice started by my predecessor, seems likely to become a tradition. I am not at all sure that it is a good one. The official reports of these exercises must usually for one reason or another be classified as "Secret," and it is probably wiser that many of our doings should by that official label be shrouded from the prying eyes of wives and such. This word "Exercise" has a fine, manly, military ring, and as our loved ones wave us off to the wars they may so far have been able to suppress any unworthy doubts caused by the fact that we never seem to take our camp beds. At least one keen exercise attender (a surgeon not a hundred miles from Aldershot as we archly say when we are sure almost everyone will know whom we mean) strikes an occasional blow for freedom as he strides off in stout boots with map-board, compass, binoculars and shooting stick. But all too soon they may realize that we are merely required to convey ourselves from our office chairs to other seats more or less comfortable according to our rank and luck, and then to convey the impression that our brains at least are furiously active.

I am afraid that this account, with its references to playlets about this and playlets about that, may well bring closer the day when we return to our homes wearing our most top-secretive empire-building expressions, to be greeted with "Well, darling, did you enjoy the charades ?"

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RECRUITMENT OF MEDICAL OFFICERS FOR THE U.S. ARMY

BY

Major R. M. HECTOR

Royal Army Medical Corps

AT the end of World War II, a severe shortage of Regular Medical Officers made itself felt in the U.S. Army Medical Corps. Only about half the pre-war strength of Medical Officers remained, although the strength of the post-war Army was increased over the pre-war figure by about five times. Not only were young doctors not coming forward as recruits on a Regular basis, but difficulty was experienced in retaining the services of those already in the Service. The situation was in fact somewhat similar to that obtaining in the R.A.M.C. at that time, and for that matter today.

In order to encourage recruitment, the U.S. Medical Authorities introduced a series of improvements along the following lines :

1. An improvement in pay and conditions of service.
2. An improvement in the training facilities available to Regular Officers.
3. A scheme under which newly qualified doctors could apply for internships in Military Hospitals for a period of a year, in the hope that they would later apply for Regular Commissions.
4. By increasing the number of non-medical officers it was intended to relieve specialists and others of as much administrative work as possible.

As a result of these measures the intake of recruits has shown a remarkable increase ; intake now exceeds wastage by a healthy margin, and if present trends continue the establishment will be filled in the foreseeable future.

Let us review each of the above headings with the object of seeing what has been done and so that some comparisons can be drawn with our own Service.

1. *Pay and Conditions of Service*

The need for attracting Medical Officers by offering them pay at a considerably higher rate than that paid to Combatant Officers was understood and accepted by the General Staff, who gave the proposition their backing; as a result the sum of 100 dollars (£35) per month is paid to all Medical (and Dental) Officers, irrespective of rank, in addition to basic pay and allowances applicable to all Arms and Services.

Specialist and Qualification pay do not exist, and in consequence administrative Medical Officers have no grouse about drawing less than their specialist colleagues.

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Some examples of "take home" pay and allowances for a Medical (or Dental) Officer with a wife and two children are given as they may be of interest:

Colonel with 30 years' service	£314	per month after tax deducted
Lieutenant-Colonel with 18 years' service	£262	ditto
Major with 12 years' service	£226	ditto
Captain with 6 years' service	£196	ditto
Lieutenant with 2 years' service	£169	ditto

Medical Officers in the Air Force draw the same rates of pay and allowances, but in addition may also draw flying pay for putting in four hours of flying per month as a passenger in certain circumstances. This ranges from 110 dollars for a Lieutenant to 210 dollars for a Colonel.

It should be added that temporary promotion to the next higher rank is comparatively easy to obtain and is retainable until made substantive. In this way an officer with comparatively short service can attain the higher income brackets quite quickly.

Although, by our reckoning, pay may appear high, it should not be assumed that living costs are all proportionately high in the United States. On the contrary, such items as petrol, cotton clothing, cars, cigarettes, tobacco, alcoholic spirits, kitchen equipment, electrical equipment, gas and electricity, some types of furniture and furnishings are even cheaper than in the U.K. Other items, such as rent, housing, hair-cuts, woollen clothing, insurance, food are generally more expensive. Service personnel are entitled to purchase from the Commissary Stores food and other necessities, and from the Post Exchange cigarettes, sweets, toilet articles, etc., at prices usually less than those ruling outside.

Medical Officers are therefore enabled to live well and have more to spend on their families and on themselves, after paying for basic needs, than we do. It is unusual for a Lieutenant not to have a car and the more senior officers often have two.

Young doctors are undoubtedly being attracted by the size of the pay cheque, and many feel that to earn as much in civil life would require much longer hours and harder work with less security.

2. *Professional Scope and Training*

Medical care is available in the U.S. Army to all serving and retired personnel and to their dependants in both in- and out-patient forms. Patients are therefore drawn from both sexes and from all age groups, with the result that a very wide range of clinical material is at hand, much wider than the range found in our Military Hospitals. This is of cardinal importance and is one of the most important ways of attracting recruits.

This vast array of clinical material, seen especially at the larger hospitals, naturally calls for extensive hospital facilities and equipment which are provided as required. Most of the bigger hospitals are of modern construction and

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design, and equipped quite as well as the most modern large civil hospitals, both in the U.S. and U.K.

Civilian specialists are adequately employed as required on a sessional basis. This not only helps to keep in touch with contemporary medicine, but their presence also assists in teaching.

Since the war great steps have been taken to widen the scope of specialist training, and now more than 300 Regulars are undergoing, on the average, a three-year training course at one or other of the big ten Military Hospitals, in all the usual specialties, at any one time.

Specialists who have received such training are expected to remain in the Corps on a permanent footing, but in the event of release from the Service at their own request they are generally required to serve one year per year of in-service training received, before being allowed to go.

There is a tendency to make all specialties of equal standing, although one or two, such as anæsthetics, do not yet appear to have reached this stage of development.

The U.S. Medical Corps are not nearly so rigid about the question of certain ranks filling certain vacancies ; for example, an A.D.M.S. of a Division or O.C. a large hospital need not be a full Colonel. This helps when it comes to selecting individuals for administrative appointments, as the choice is obviously wider, and often means that a specialist, who under our system would be a sitting bird for an administrative appointment, could continue in his specialty as a full Colonel or above. Specialists therefore have a good chance of reaching the higher ranks, and the apprehension at the thought of ceasing to use one's technical skill while yet in one's prime has diminished. The prospect of reaching higher rank as a specialist must surely help in recruitment.

3. *The Provision of Rotating Internships*

As a possible way of attracting young doctors to the Service, a system of a one year's internship was introduced whereby selected applicants, numbering 210 per annum (60 of whom are Air Force Medical Corps Officers), are taken on as Lieutenants and are posted to certain of the larger hospitals. During this time, while on army rates of pay, they spend two months in each department as selected by them, where they are given every consideration and as much teaching as possible. Interns during their first year do not draw the $100 extra per month. At the end of this year, in return, they are obliged to do one further year's service, after which they are free to leave.

In practice this has proved most popular as not only are the interns enabled to work in well-equipped and modern hospitals offering first-class clinical material, but they are paid at much higher rates than they could possibly obtain in civil hospitals. The after results are also satisfactory, as about 50 per cent. of these interns elect to take permanent commissions.

There can be no doubt that young doctors today, in choosing a medical career, value professional experience above all else, and that an army can only

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attract them in adequate numbers by offering as good or better general and specialized medical experience as can be obtained in civil life. This the U.S. Army Medical Corps is offering.

4. *The Employment of Non-Medical Officers*

In order to reduce the load of administrative work done by Medical Officers, non-medical officers of the Medical Service Corps are employed on a somewhat wider scale than in the R.A.M.C. For instance, the keeping of mess accounts and auditing thereof are done by them as part of their duties. The spectacle of a specialist wrestling with mess accounts far into the night, in a seemingly hopeless attempt to get things to balance by the morrow, is now a thing of the past.

The employment of civilian clerks, cleaners and technicians must also be mentioned. A high proportion of such vacancies on establishment are purposely filled by civilians. This has the important effects of maintaining continuity and a high standard of efficiency and gives a more professional air to hospitals. The frequent changes of personnel so common in every Military Hospital are thus not allowed to upset departmental efficiency as there are always permanent civilian employees still there to carry on. Also the practice of posting trainee technicians or general duty orderlies to fill vacancies on establishments is largely overcome, because there are fewer vacancies to fill. It could be argued that under this system there must be a shortage of trained military clerks and technicians in the event of an emergency. In such an event there is always a severe shortage of every type of tradesmen, and deficiencies have either to be made up by call-up of civilians or by rapid training methods as required.

It is satisfactory to observe that there is a general feeling of pride and satisfaction felt by members of the U.S.A.M.C. in their Corps and in what has been achieved.

INCIDENCE OF MIDDLE EAR DISEASE IN SERVING SOLDIERS

BY

Captain H. B. JUBY, M.B., B.S., D.L.O.

Royal Army Medical Corps

DISEASE of the middle ear is probably the commonest single cause of rejection of recruits for the Army. Guthrie (1936) reported that in the nine years 1927–1935, 28 per cent. of 2,931 recruits examined had chronic suppurative otitis media. In spite of the fact that many men are rejected for service on account of it, chronic otitis media was found to be common in the Armed Forces during the 1939–1945 war. Banham (1945) found that 20 per cent. of patients attending an R.A.F. aural clinic had active chronic middle ear suppuration ; Craig (1941) reported that 25 per cent. of patients at a Military Hospital were affected ; and Brown Kelly (1945) found that 30 per cent. of cases dealt with at a Naval Hospital had aural disease. Myles Formby (1945) stated that during 1943 there were

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1,000 soldiers reporting sick in Britain every week with ear trouble and that more than half of these had chronic middle ear suppuration. Recent personal experience suggested that chronic suppurative otitis media is still a common disease among serving soldiers, necessitating considerable in-patient and out-patient treatment at Military Hospitals.

A series of patients seen in the Surgical Department of a Military Hospital in B.A.O.R. was questioned and examined in an attempt to assess the incidence of aural disease in serving soldiers. The patients included both in-patients and out-patients referred or admitted to hospital for conditions other than ear trouble. The average age of the patients was 22, the majority being National Service men between the age of 19 and 21.

History.—Each patient was asked if he had ever suffered from ear trouble, followed by questioning for a history of earache or aural discharge. From the answers received patients were divided into "Positive history" and "Negative history" groups. Patients who had had their ears "syringed for wax" with no other symptoms were placed in the "Negative history" group. One hundred and forty patients were also asked if their tonsils had been removed. 33 per cent. had had their tonsils removed, 66 per cent. had not, and one man had one tonsil removed.

Examination.—Each patient's ears were examined with an electric auriscope. If both tympanic membranes were normal no further examination was performed. Wax sufficient to obscure the view of the tympanic membrane was present in both ears in 15 patients (10 per cent.) and in one ear in a further 18 patients (12 per cent.). In each case the wax was removed by syringing. If there was any aural abnormality other than the presence of wax, the ears, nose and throat were examined in greater detail. From the results of the examination patients were divided into groups with "Positive findings" and "Negative findings."

TABLE I.

		No. of Cases	Percentage
Group I	Negative history, negative findings	109	72.6
Group II	Negative history, positive findings	2	1.33
Group III	Positive history, negative findings	13	8.6
Group IV	Positive history, positive findings	26	17.3
	TOTALS	150	100

Results.—Patients were divided into four groups, as shown in Table I.

Group I : These patients gave no history of any ear trouble and had normal ears on examination.

Group II : Two patients gave no history of ear trouble but had a scarred tympanic membrane on examination. On further questioning, neither of these patients could remember having had earache or aural discharge. Presumably they suffered an attack of otitis media in infancy and no recurrence in later years.

Group III : Thirteen patients gave a history of earache, with or without aural discharge, but presented normal ears on examination. These patients may have suffered from otitis externa, furunculosis or otitis media which resolved completely.

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Group IV: Twenty-six patients gave a history of ear trouble and had abnormal ears on examination. Of these, 4 patients had otitis externa at the time of examination and from their history had probably had it before; 13 patients showed scarring of one or both tympanic membranes; 2 patients had a dry perforation of the tympanic membrane—both these patients had a scarred tympanic membrane in the other ear; and 7 patients had active chronic suppurative otitis media with a perforation of the tympanic membrane and discharge at the time of examination.

One of the patients with a scarred tympanic membrane and one of those with a discharging ear had had mastoid operations for acute mastoiditis.

TABLE II.—PATIENTS WITH "POSITIVE FINDINGS" (GROUPS II AND IV)

	No. of Cases	Percentage of Total
Otitis Externa	4	2.6
Otitis Media		
Scarred tympanic membrane	15	10
Dry perforation of tympanic membrane	2	1.3
Perforation of tympanic membrane and discharge	7	4.6

Out of 150 patients examined, 39 (26 per cent.) gave a history of ear trouble and 28 (18.6 per cent.) showed signs of aural disease on examination. Fifteen patients showed evidence of healed otitis media, an incidence of 10 per cent. Nine patients showed evidence of chronic suppurative otitis media, which was active in 7 cases and quiescent in 2 cases, an incidence of 6 per cent.

PULHEEMS Assessment.—The medical category of the 9 patients with chronic suppurative otitis media was investigated, and it was found that in all except two cases it was P1 or P2 and H1 or H2. In one case the aural disease had probably arisen during Army service, but in the other six patients the history extended back to childhood, indicating that these men had been incorrectly assessed on entry to the Army. None of these patients with chronic suppurative otitis media should be assessed higher than P5, with the H assessment depending on the degree of impairment of hearing. Those with active disease necessitating frequent treatment should be P7.

Summary.—Chronic middle ear disease is common among serving soldiers in spite of the fact that it is a frequent cause of rejection of recruits. In a series of patients attending a Military Hospital with complaints other than ear trouble it was found that 6 per cent. suffered from chronic suppurative otitis media and that a further 10 per cent. showed evidence of healed otitis media.

My thanks are due to Colonel J. Gordon Black, A.D.M.S., British Troops, Berlin, for permission to publish this article.

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SIR JOHN WEBB, 1772-1852

BY

Lieut.-Colonel F. W. WEBB, O.B.E.
Royal Artillery

In March, 1794, John Webb (165 in Kane's List of Officers) was appointed Regimental Surgeon's Mate to the 53rd Foot (now 1st Bn. K.S.L.I.). He served on the continent of Europe with his regiment, under the command of the Duke of York, and was present at the battle of Lannoy in May, 1794. After a year on the hospital staff in Flanders, he was promoted to Surgeon in his regiment and in November, 1795, accompanied them to the West Indies as part of General Abercromby's expedition. He was present at the capture of Morne Fortune, which is ranked by the Hon. Sir John Fortescue as being one of the most notable exploits ever carried out by the British Army. Morne Fortune was a precipitous mountain dominating an island which was a key to the Windward Island passage used by our convoy. The attack on it was a brilliant example of co-operation between the Royal Navy and the Army, but it took four weeks of intense fighting to overcome the French resistance on the mountain.

John Webb's next operations were the capture of St. Lucia and the expulsion of the Caribs from St. Vincent in 1796, and he also took part in the capture of Trinidad and the descent on Porto Rico in 1797. During this campaign he came to the notice of General Abercromby, and at the end he was given a staff appointment in the Ordnance Medical Department. It was in this department, forerunner of the Army Medical Service and of the R.A.M.C., that he spent no less than fifty-three years.

The casualties from wounds in the West Indies were negligible in comparison with those from disease, and of all the diseases to which the troops were exposed yellow fever in epidemic form was the worst. During the operations from 1795 to 1797, over half the garrisons in the West Indies died from yellow fever. The successful operations were undertaken with raw recruits in the poorest of health, and the fever accompanied them wherever they went. Regiments looked after their own patients, and the life of the regimental surgeon dealing with them was normally short and not sweet. Even for those days the Webb constitution must have been tough beyond the ordinary.

Returning from the West Indies in June, 1798, after an arduous two and a half years of active service there, he was soon off again and took part in the expedition of Den Helder in Holland, August to November, 1799. He was present at the reduction of Den Helder and the capture of the Texel fleet.

John Webb appears to have made a speciality of combined operations. The expeditions in the West Indies were among the earliest examples of success achieved by close co-operation between the Royal Navy and the Army, and for the whole of his active service he was closely involved in similar expeditions.

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The conclusion of the Helder operations coincided with his appointment as Inspector of Field Hospitals, and his return again to England for a short time. A few months later, in August, 1800, he was on his way to the Mediterranean, and took part in actions off the coast of Spain before being ordered to join General Abercromby's expedition assembling at Marmorice in Asiatic Turkey.

Napoleon had realized that his dreams of world conquest depended on the capture of Egypt, the stepping-stone to the Far East. Hitler had similar ideas, and 140 years later Sir John's great-great-great-nephew was engaged in operations in exactly the same area.

Egypt was occupied at the beginning of 1801 by Napoleon's Army of the East, and General Sir Ralph Abercromby's expedition landed in a heavy storm in Aboukir Bay on 8th March. The French were driven back towards Alexandria and after an attack on 13th March withdrew into the town itself, taking up a position on a narrow strip of land between the sea and Lake Mareotis. On 21st March the French attacked the British position and broke through. It was then that the 28th Foot (now 1st Bn. Gloucester Regiment) fought back to back and earned the right to wear a second badge on the back of their headdress. After severe fighting the position was restored, but General Abercromby was mortally wounded. A print at Blakenhall* of the death of General Abercromby shows him being attended by a surgeon who, according to family tradition, was John Webb.

Alexandria did not finally capitulate until 2nd September, after heavy fighting. In the meantime, the force had also moved on to Cairo and captured it on 27th June.

Sir John Webb was in the action at the landing at Aboukir Bay on 8th March, took part in the actions of 13th and 21st March and the capture of Grand Cairo, and was present in all subsequent operations, including the capitulation of Alexandria. After fighting ended he was made Assistant Inspector of Hospitals, and later became Deputy Inspector of Hospitals. He stayed on in Egypt until April, 1806.

For his services in Egypt he was awarded the Order of the Crescent by the Sultan of Egypt. This order, sometimes known as the Sultan's Medal, is in gold and is suspended from a fine gold chain. The ribbon is orange, and the medal, 1.7 inches in diameter, is the third of the four sizes issued to officers.

This was Sir John's first medal or decoration in spite of his having been more or less continually in action for seven years. He was to wait another forty-nine years before he received his next—and only British—campaign medal which was won on the same occasion. It was not until 1848 that Queen Victoria authorized a Military General Service Medal for the war against France, 1793 to 1814. The medal was not issued to all who took part in the various stages of the war, but only for one or more of twenty-nine specified actions or campaigns. It is possible that the original intention was to issue it to anyone who saw active service in the war between those dates, and that later this intention was abandoned. The medal bears the head of Queen Victoria, who

* Blakenhall, the family seat of the Webb family, near Sevenoaks, Kent.

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did not succeed to the throne until twenty-three years after the end of the war, and is dated 1848. Egypt was the first of the clasps to be authorized (1850), and the medal was not issued without a clasp. So those who took part in the first eight years of the war, and not in subsequent operations, were not eligible. Also the medal was only issued to those who were still living in 1848. Sir John received his medal in 1851, just after his retirement, and shortly before his death.

The portrait of Sir John Webb at Blakenhall is supposed to have been painted on his retirement in 1850. It shows him wearing the insignia of a Knight Commander of the Guelphic Order of Hanover, the C.B. and the gold Order of the Crescent, but not the Military General Service Medal for Egypt. All four of these are now in the Webb Collection.

In 1803 plague broke out among the British troops who were being withdrawn from Egypt. Sir John Webb volunteered to take medical charge of the plague ship to which all patients were transferred, and which was anchored well out in the harbour of Alexandria. Here he remained for some months in strict quarantine, doctoring the patients and studying the disease, until the epidemic died down. This unenviable job earned him considerable honour in his professional career, and he later published a paper on the treatment of plague with an exceedingly long title.

He was back in England again in the middle of 1806, and the following year took part in the Baltic Expedition. He was present at the siege of Copenhagen and the capture of the Danish fleet, November, 1807. After a short spell at home, he was promoted in July, 1809, to be Inspector of Hospitals. As such he took part in the Walcheren Expedition to the Scheldt, July to September, 1809, and on his return was made Inspector-General of Hospitals.

In August, 1813, he became Director-General of the Ordnance Medical Department. In just under twenty years he had progressed from an Assistant Surgeon in a regiment of foot to the head of the Army Medical Services, and had spent fifteen years on active service.

There seem to have been no rules regarding length of tenure of appointment in those days. Sir John remained Director-General of the Ordnance Medical Department for the next thirty-seven years, and finally retired on full pay on 1st April, 1850. He was then seventy-eight years of age.

Sir John was created a Knight Bachelor in 1821, elected a Knight Commander of the Guelphic Order of Hanover in 1832, and awarded the C.B. in 1850. Not only was the tenure of appointment different in those times. The award of honours was apparently viewed in a different light. When he was awarded the C.B. he sent a petition to the Queen, stating that his rank and services entitled him to be granted the K.C.B. instead of the C.B. It seems that Her Majesty took a different view. At any rate, the petition was not granted.

The post of Director-General does not appear to have been a full-time job, for he became M.D. and F.R.C.S. in 1843, was a magistrate, and a Deputy Lieutenant for the County of Kent for thirty-two years. He died on 16th September, 1852, at his residence, Chatham Lodge, Woolwich Common, and was buried at St. Thomas's Church, Woolwich.

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The years between the end of the Napoleonic Wars and the outbreak of the Crimean War are probably the worst period through which the British Army has ever passed. Not for the first time, and certainly not for the last, Parliament effected at the expense of the armed forces a series of sweeping economies. The Army was shamefully neglected, and the modernization which took place in the civil life of the country was not allowed to be extended to the armed forces. Not only were there no reforms to bring the Army up to date, but its existing state and its existing stores were allowed to rot away, morally and physically.

A study of the medical arrangements current in the Army at the beginning of the Crimean War bears this out and forms a notable example. The Ordnance Medical Department was staffed by doctors and purveyors who held no military rank and who were responsible to four different authorities. These were the Secretary of State for War, the Secretary-at-War, the Commander-in-Chief and the Board of Ordnance. They controlled no military hospitals, for there were none to control; it was not until ten years after Crimea that the first was built. Military sick and wounded were the direct responsibility of the regiments to which they belonged.

The public outcry that arose when the state of the medical arrangements in the Crimea became known in England led to some improvements. That they were necessary is shown by the fact that the nearest hospital to the Crimea was 100 miles away at Scutari; there were no nurses, few drugs and practically no stores. More casualties were caused by disease than by the enemy, and by present-day standards there were no medical arrangements at all, while hygiene and sanitation had apparently not been thought worthy of consideration. In those early days it was only a strong constitution that enabled a wounded man to survive.

The state of the Army at that time is largely attributable to the aged Duke of Wellington. He was by far the most brilliant military leader of his century, but his view was, and remained for the rest of his long life, that what had been good enough for his Army when they beat Napoleon was good enough now. He set his face against all reforms both when he was a politician and when, from 1842 to 1852, he again was Commander-in-Chief.

When considering the distinguished career of Sir John Webb, it is interesting, and rather sad, to reflect on the result of officers being allowed to remain so long at the head of a military department. Sir John Webb retired only four years before the outbreak of the Crimean War. One is tempted to speculate whether the state of the Army's Medical Services, and indeed the state of the whole Army, at the beginning of that campaign might not have been very different if the appointments at the top had previously been filled by a succession of younger men.

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Correspondence

BRITISH MILITARY HOSPITAL,
KINRARA,
c/o G.P.O. KUALA LUMPUR,
MALAYA.

31*st October*, 1952.

DEAR SIR,

I was glad to read Major Hector's letter in your June issue, and I should like, with your permission, to enlarge on the points he has raised.

Major Hector's premise regarding a "major" hospital is correct. His points about layout and forethought in planning are well taken, but it should be borne in mind

(*a*) that the "layout" he criticizes is not a layout at all, but a circulation diagram ;

(*b*) that the "hospital planners" have to restrict their planning chiefly on financial grounds, to provide accommodation only for what staff and equipment are likely to be available within the foreseeable future—say ten years. No other plan will survive Treasury scrutiny.

Layout.—Only a circulation diagram was given. This is a form of "shorthand," useful to architects ; it indicates briefly what should be near to what, and what should not have direct access to what else. The actual layout along a corridor or around (e.g.) a central waiting room is developed by the architect from the information given to him condensed in this diagram, and is then submitted to his client for approval.

I quite agree with Major Hector's remarks on layout, and only mention the foregoing point in order to avoid confusion for any other readers. The diagrams are NOT intended to represent actual rooms or huts or corridors.

Radiography Rooms.—The number of radiography rooms he recommends is certainly ideal, but it is hard to see how they are to be equipped or staffed. The scale of equipment available to the average large major hospital is not likely (at least within the next five or six years) to exceed one each of 80/15, 90/30, and 100/150 units. The Army X-ray equipment has essentially to be versatile ; one set or perhaps two are all that is available, in most hospitals, to perform all the functions quoted by Major Hector. Staff is not all that lavish, and for convenience alone it is usually preferable to accommodate the apparatus, and the staff to work it, in as few rooms as is compatible with comfort and convenience. The planner has always to resolve the conflict between what is ideal and what is possible.

Dark Room and Drying Cabinets.—The size of dark room given is that for temperate climates. In all accommodation planning, an increment for sub-

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tropical or tropical climates is added (12½ per cent. and 20 per cent. respectively) as required.

The location of a drying cabinet actually in the dark room is by no means always ideal. The pattern at present in use by the Army radiates a considerable amount of heat and this makes its presence in dark rooms undesirable. The heat emitted may also seriously affect the efficiency of the air conditioning of radiography rooms and dark rooms, in tropical stations. As for automatic processing machines, these have yet to be fully developed and it is perhaps premature at present to allow specifically for them.

Stenographer.—It is hard to see why the stenographer cannot use the X-ray department office for typing, and the radiologist's consulting and viewing room for taking down dictation. The actual provision of a stenographer is not, alas, the prerogative of the planner.

Radiographers' Room.—This room has been included. It is shown as item number 9 on the circulation diagram (Fig. 9 on p. 117), and appears as item (vi) in the text.

Conference Room.—This is an excellent suggestion and should certainly meet with a warm welcome from all radiologists. Unfortunately its provision as a strict necessity can hardly be justified. So very few military hospitals have regular and frequent radiological conferences, or such a large film library, as to make an X-ray conference room essential. Could not the Medical Officers' Library serve the same purpose, as suggested in Part V of the article (vide "Offices," sub-para. (*d*), p. 178)? This would only entail the X-ray staff carrying such films, etc., as were required from their department to the library. Viewing boxes would normally be part of the library's equipment.

I apologize if I have taken up too much of your space in replying to Major Hector, but his suggestions are so well thought out and constructive that I felt they merited a detailed discussion.

Yours faithfully,

S MACKENZIE,
Lieut.-Colonel.

100 HARLEY STREET,
LONDON, W.1.

12th November, 1952.

DEAR SIR,

I have been keenly awaiting Major Crean's article in your last issue. He umpired me on "Surprise Packet" and we had many an argument on the Divisional Medical organization.

It seems to me that the set-up which he proposes is basically wrong. There are three aspects of the handling of the casualty within the Division. These are collection, evacuation and treatment. The relative demands of these forms of

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service have the widest possible variation according to the nature of the battle, terrain and climate. The most economical way to provide these services is from one single unit, and in this way personnel, equipment and vehicles can be distributed to be of maximum benefit.

I entirely agree that regimental stretcher-bearers should all be R.A.M.C. personnel rather than the present unbalanced position where only the N.C.Os. are members of the Corps.

With regard to the field ambulance establishment, this is not something which is fixed for ever and a day, but something which is constantly changing, according to altering circumstances.

I cannot quite see how the organization which Major Crean proposes can provide for mountain warfare in which hand carriage is the main means of evacuation in the forward areas, or, again, in the type of airborne operation in which it is not possible to take vehicles, or in the early phases of assault river crossing before casualty-carrying vehicles have been phased into the bridgehead.

There is one quarrel I have with the layout of field ambulance establishments, and that is differentiation between stretcher-bearer and nursing orderly, which seems to me to be entirely artificial. The stretcher-bearer, who is a second-class nursing orderly, is obviously a better man than the nursing orderly, who is only a N.O.3, and it would seem to me far better to lay down training standards than to continue with the present system.

In conclusion, I must say that I am in fundamental disagreement with Major Crean's arguments. I am sure that the field ambulance is potentially the most elastic and adaptable unit in the Medical Service, but, obviously, is only as elastic as the mind of its Commander and as adaptable as the training standard of its personnel permits.

Yours faithfully,

G. RIGBY-JONES, *Colonel,*
A.D.M.S., 16*th Airborne Div.*, *T.A.*

23 PARACHUTE FIELD AMBULANCE,
M.E.L.F. 28.

30*th October*, 1952.

DEAR SIR,

In his paper, "A Little Surprise Packet," in the October, 1952, number of the Journal, Major G. P. Crean poses several questions to airborne readers. My present appointment compels me to make some reply, although I do so reluctantly as the final form of the parachute field ambulance is still being debated in official circles.

I am not satisfied with the present establishment, which is the standardized one, and I very much agree with regimental stretcher-bearers in battalions being replaced by R.A.M.C. personnel. On the other hand, I am quite satisfied that

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the F.D.S. cannot replace a field ambulance in either the airborne or the ground role. I quite agree that the field ambulance (H.E.) is a waste of manpower.

Perhaps Major Crean may care to look up a paper of my own, "The Parachute Field Ambulance," published in the Journal of November, 1947, in which he will see that parachute battalions in the 1939–1945 war had no regimental stretcher-bearers, having 18 other ranks R.A.M.C. instead. The parachute field ambulance of these days consisted of 182 all ranks and included the necessary specialist personnel to form two surgical teams. Standardization has now resulted in the unwieldy 234 all ranks plus, when on an airborne operation, two F.S.Us., each of 10 all ranks.

It is essentially a surgical unit in the airborne role and, in spite of inevitable casualties on operations, it certainly proved its worth. In my opinion it should never have been standardized, and the only sure solution I know to the present dilemma is to return to the 1945 War Establishment.

Major Crean appears to make the assumption that a parachute field ambulance has the same equipment as any other, but the A.F.I. 1248 is much more lavish and includes the necessary items for two surgical teams, plus reserves, and for five days' re-supply by air. A very large amount of equipment is written off on any airborne operation and the sea/land tail practically arrives with a new set to enable the unit to carry on in a ground role.

I must join issue on the subject of adaptability. The 1945 parachute field ambulance consisted of a H.Q. and four sections, the H.Q. forming a surgical centre. I do not think there has been a more adaptable field medical unit than this in the history of the Corps. The F.D.S. could not undertake its role without the addition of F.S.Us. and stretcher-bearers. Who is going to make these attachments, and at what stage prior to an operation are they going to be effected ? The parachute field ambulance can function as a field ambulance in any type of division and in any type of assault landing. It can be a C.C.S. or, as happened several times in the last war, it can run a general hospital. It can even be an F.D.S. I should perhaps add that there never was a F.D.S. in an airborne division. What is better suited for the "bastion" warfare of the future so sensibly referred to by Major Crean ?

I leave it to an infantry field ambulance commander to discuss Major Crean's theory as it affects him. I am sure his answer will be to modify the field ambulance establishment and abolish the F.D.S.

Yours faithfully,

ALASTAIR D. YOUNG,
Lieut.-Colonel, R.A.M.C.

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Matters of Interest

CONVERSAZIONE—ROYAL ARMY MEDICAL COLLEGE

On the invitation of Major-General F. R. H. Mollan, *C.B.*, *O.B.E.*, *M.C.*, Q.H.S., Commandant, a party of Deans and Students from London Medical Schools visited the Royal Army Medical College on 5th November, 1952.

They were met in the ante-room of the H.Q. Mess by the Commandant and Staff and entertained to lunch, after which the Commandant in a short address of welcome in the Theatre outlined the history, tradition and scope of the College. This was followed by a short talk on Tropical Medicine by Colonel Drew, and the party then split up for demonstrations in the Army Health and Pathology Laboratories, conducted by Colonels Campbell and MacFarlane, the respective Professors. Following the demonstrations a conducted tour was made of the College and in particular the Pathology Museum, finishing up with tea in the Library.

The visitors obviously enjoyed themselves and appeared to be very impressed and surprised by the scope and extent of the work of the College.

It was felt that a further strong link had been forged between the College and the London Medical Schools as a result of this enjoyable occasion, and as a footnote it might be added that one student remarked that he now no longer dreaded his National Service!

The following deans were present, together with two representatives of their Students' Unions: M. F. Nichols, Esq., *C.B.E.*, M.A., M.Ch., F.R.C.S., St. George's; A. E. Harding, Esq., F.R.C.S., Westminster; Brigadier J. C. Hawksley, *O.B.E.*, Ph.D., M.D., F.R.C.P., University College; A. C. Cross, Esq., M.A., M.D., F.R.C.S., St. Mary's; Miss K. G. Lloyd-Williams, M.D., F.F.A.R.C.S., Royal Free; Brigadier A. L. Crockford, *D.S.O.*, *O.B.E.*, *M.C.*, *T.D.*, M.A., M.D., Q.H.S., Secretary of St. Thomas's; and Professor W. J. Hamilton, Professor of Anatomy, Charing Cross. Two students each were present from Guy's, Bart's, King's, London and the Middlesex.

L. R. S. M.

BERTRAND STEWART PRIZE ESSAY COMPETITION, 1953

The subject for next year's competition is as follows:

> "It is sometimes stated that the progress of modern weapons and mechanization is causing too great a reliance to be placed in their possession and too little on the fighting determination of the soldier himself. Discuss the truth of this opinion, and how such a tendency could best be rectified or prevented."

The rules for the 1953 Competition were given in the July, 1952, and October, 1952, editions of *The Army Quarterly*.

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PAPERS BY R.A.M.C. OFFICERS

THE Editor has lately noted the following papers, published in other journals by officers of, and late of, the Corps. It does not profess necessarily to be complete, and he would be grateful to officers who have articles published elsewhere than in this Journal if they would write to him giving particulars for inclusion in subsequent lists. The Librarian, R.A.M. College, would appreciate a reprint of any article in a journal which the library does not receive.

Boyd, Brigadier J. S. K.: Bacteriophage-typing and Epidemiological Problems. *Brit. med. J.* (1952), ii, 679-685.

Boyd, Brigadier J. S. K.: Introduction to a Symposium on Daraprim. *Trans. R. Soc. Trop. Med. and Hyg.* (1952), **46**, 465.

Buckland, Brigadier F. E.: Male-Toad test for Pregnancy. *Lancet* (1952), ii, 1035.

Cantlie, Lieut.-General Sir Neil: Impressions of a Visit to Korea and Japan. *Brit. med. J.* (1952), ii, 1253-1255.

Cowell, Major-General Sir Ernest: Appreciations of the late Major-General P. H. Mitchiner. *Brit. med. J.* (1952), ii, 944.

Farrant, Captain P. C. and Buckland, Brigadier F. E.: A Pregnancy Test. *Lancet* (1952), ii, 990.

Harris, Lieut.-General F.: Appreciation of the late Major-General P. H. Mitchiner. *Brit. med. J.* (1952), ii, 1048-9, and *Lancet* (1952), ii, 941-2.

Hobson, Lieut.-Colonel A. C. S., Fraser, Captain D. E., and Newman, Captain N. H.: Tattooing as a Possible Means of Transmitting Viral Hepatitis. *Brit. med. J.* (1952), i, 1111-2.

Lewis, Major M. M.: Contribution to a discussion on "Health: its Study and Culture, in the Nation Today." *Proc. R. Soc. Med.* (1952), **45**, 472-3.

McFadzean, A. J. S., and Stewart, Major P. D.: Chloramphenicol in Acute Shigella-Dysentery. *Lancet* (1952), ii, 166-168.

MacFarlane, Major R. G.: Malaria in Ex-Service Men. *Lancet* (1952), ii, 288.

Marmion, Major D. E.: The Treatment of Typhoid Fever with Chloramphenicol. *Trans. R. Soc. Trop. Med. and Hyg.* (1952), **46**, 619-638.

Rankin, Major-General H. C. D.: A Review of Army Health (Blackham Memorial Lecture). *J. R. Inst. Pub. Health and Hyg.* (1952), **15**, 319-324.

Rowe, Captain A. J.: Epidemic Hæmorrhagic Fever. *Lancet* (1952), ii, 980-982.

Sachs, Brigadier A.: Modern Views on the Prevention of Tetanus in the Wounded. *Proc. R. Soc. Med.* (1952), **45**, 641-650.

Sachs, Brigadier A.: The Medical Problems of Atomic, Bacteriological and Chemical Warfare. *Journal of the Royal United Services Institution* (1952), **97**, 354-363.

Ward, Captain M. P.: In Eastern Nepal. *Lancet* (1952), ii, 238.

Wright, P. J. M., and Southwood, Captain W. F. W.: Traumatic Rupture of a Cyst of the Mesocolon. *Brit. med. J.* (1952), ii, 761.

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Book Reviews

Any Questions: 2nd Series. London: British Medical Association. 1952. Pp. xii+195. 7s. 6d.

When the first series of "Any Questions" was produced by the *British Medical Journal* in book form, the Editors adopted the irritating habit of printing some intriguing question in the Journal and then telling the reader to satisfy his curiosity by buying the book. Now that a second series has been published it is only too probable that this practice will continue, for the book does indeed contain the answers to many fascinating conundrums.

Slim as it is, we cannot agree with the publishers that it is suitable for the pocket. That would not do at all for a military man. It will, however, be a more than ornamental addition to the Regimental Medical Officer's personal library, for here at last are the answers to so many of those daily problems which beset him, from the immunization of the Sergeant-Major's baby to the marital problems of the Junior Subaltern.

Experts have provided the answers and it is with some diffidence, therefore, that we suggest that in a future edition the section on tetanus prophylaxis be brought up to date. The primary course of toxoid is three injections, and the potential value of this agent in schools might also have been stressed.

It is surprising to learn that viper bites in this country are comparatively harmless and seldom call for hospitalization. This is not our experience.

There is some useful information on prickly heat, but no suggestion that the best preventive is to avoid over indulgence in food, alcohol or clothing.

No doubt others will find further matters in their own line to carp at, but the book remains excellent value for 7s. 6d. and in any case has some useful advertisements.

A. J. N. W.

Practical Procedures ("Practitioner" Handbook). Edited by Sir Heneage Ogilvie and W. A. R. Thompson. London: Eyre and Spottiswoode. 2nd Edition, 1952. 25s.

This volume of the "Practitioner" handbooks contains twenty-seven chapters, in which are described the details of many everyday minor procedures, such as examination of the nasopharynx and the rectum, lumbar puncture, technique of biopsy and of hormone implantation, etc. A very useful little book for the recently qualified houseman, who has not had the opportunity during his undergraduate days of much bedside experience. The book is very readable and well produced, and there are few who will not find some practical points of value throughout its twenty-seven chapters.

A. G. H.

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REFRESHER COURSE FOR GENERAL PRACTITIONERS. London: British Medical Association. 1952. Pp. x+486. 25s.

This volume, published by the British Medical Association, is the outcome of a popular demand from general practitioners for the publication in book form of the well-known series of articles, covering various aspects of medical practice, which have appeared in the *British Medical Journal.* The period covered is from October, 1949, to the end of 1950.

This book is a literary excursion into many fields of general practice and the authors have managed to retain a proper balance between old and new ideas. The harassed practitioner will find the book easy to read and essentially practical in its treatment of common medical problems. There is perhaps a certain lack of cohesion which is inevitable in a book by multiple authors, but the contrast in styles tends to avoid monotony.

The print is large and clear and the line-drawings and photographs are excellently produced.

The fifty-five articles cover all fields of practice and the selection of subjects has been wise and judicious, though the purist may possibly consider that "Failed Forceps" and Pink Disease lie within the realm of the specialist.

This book is sure to be popular with practitioners and students.

R. G. M.

A SHORT PRACTICE OF SURGERY. Hamilton Bailey and R. J. McNeill Love. London: H. K. Lewis. 9th Edition, 1952. Pp. viii+1254 (1,234 illus.). 55s.

There has been a new edition of Bailey and Love every two or three years since 1932. This new edition fully sustains the standard of the previous volumes, though the section on wound treatment is inadequately dealt with.

It remains a most lucid and informative textbook on surgery, and retains the triad of—numerous illustrations—relegation of the rarer conditions and of surgical details to smaller type—and short biographical notes, at the bottom of the page, of surgeons whose names are mentioned in the text.

A. G. H.

BROMPTON HOSPITAL REPORTS, Vol. XX. Aldershot: Gale and Polden. 1952. Pp. vii+196. 12s. 6d.

This is a collection of most interesting papers recently published from the hospital. The contributors are well known members of the profession and are recognized authorities on their subjects. The book is of value to candidates preparing for higher medical degrees and to all those interested in thoracic diseases. The articles on Suppurative Pneumonia, Tuberculoma of the Lung, Carcinoma of the Bronchus and the review of tuberculosis of the upper air passages are of outstanding interest. The X-ray reproductions are very clear and instructive.

R. A. S.

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In the next edition the editor might stress the following points which may have been omitted : In the treatment of shock, fluids by mouth should not be given if an anæsthetic is to be given within a few hours ; local heat should not be applied to shocked patients ; the four-tail bandage for a fractured mandible does more harm than good ; the importance of salt in the treatment of the "Effects of Heat" has been omitted ; the dangers of using a tourniquet have not been stressed sufficiently ; petrol was the chief cause of burn casualties during the last war, yet it has not been mentioned in the text.

The following points should be stressed in the application of Thomas splint : The stretcher bars must be checked ; the tongue of the shoe must be padded with cotton-wool ; the ring of the splint must be held firmly against the tuber ischii.

R. A. S.

AIDS TO THE ANALYSIS OF FOOD AND DRUGS. By J. R. Nicholls, *C.B.E.*, *D.S.O.*, F.R.I.C. 7th Edition. Pp. 516. London : Baillière, Tindall and Cox. 1952. 12s. 6d.

In the seventh edition of this book, Dr. Nicholls has rearranged the subject-matter into chapters, each dealing with one subject such as dairy products, starch foods, meat products, etc. He has also added a chapter at the beginning, dealing with the chemistry of the constituents of foods and their determination. The subject-matter is much the same as in the previous edition, but usually three or four pages containing recent information have been added to each subject.

In order to save space, the author presupposes a knowledge of some of the methods, but in these cases references to the original articles or to standard works are given. For example, the Hortvet freezing-point test for milk is mentioned and its interpretation given, but the reader is referred to the very detailed description given in Methods of Analysis by the Association of Official Agricultural Chemists in America and to articles in the *Analyst*. These, of course, are readily available to most analysts.

Omissions are rare, but it is thought that Dr. Nicholl's experience of the examination of tinned foods might be incorporated into the section on food containers and wrappings.

The book has undoubtedly, in the past, been of the greatest use to analysts and its usefulness is certainly enhanced in this new edition. The author is to be congratulated on the care which he has obviously taken, on the lucid text and on the freedom from errors.

S. E.

The Editor regrets that lack of space precludes publication of reviews of :

ALLERGY AND SEBORRHŒA. J. Avit Scott, M.D. London : H. K. Lewis. 1952. Pp. 100. 12s. 6d.

PARENTAL CARE AND ITS EVOLUTION IN BIRDS. S. Charles Kendeigh. Illinois Biological Monographs, XXII, 1-3. (University of Illinois Press, Urbana.) 1952.

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EDITORIAL NOTICES

Original articles, notes and letters bearing upon either the medical or the military aspect of the work of the Corps will be gladly received. All papers intended for publication should be typewritten (*not* duplicated), double-spaced and fully corrected. Proofs are not sent to authors serving out of the United Kingdom.

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Twelve off-prints will be sent to contributors of all main articles. Additional off-prints will be supplied on payment if ordered when the manuscript is submitted.

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Changes of address and rank, which should be promptly notified, and communications regarding subscriptions, etc., should be addressed to "The Manager, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

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The October, 1953, number of this Journal will be issued as Vol. 99, No. 5. Vol. 100 will begin with the issue of January, 1954, that and subsequent volumes to consist of the four quarterly numbers of one calendar year.

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Colonel Sir William Horrocks

Editor, 1908 – 1941

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MESSAGE FROM H.M. QUEEN ELIZABETH THE QUEEN MOTHER, COLONEL-IN-CHIEF, ROYAL ARMY MEDICAL CORPS

On the occasion of the Jubilee of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, the following message was sent to the Colonel-in-Chief by Major-General J. M. Macfie, Representative Colonel Commandant :

"All ranks of the Royal Army Medical Corps send loyal greetings to Her Majesty Queen Elizabeth the Queen Mother, their Colonel-in-Chief, on the fiftieth anniversary of the publication of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, and are deeply appreciative of the lively and continued interest Her Majesty takes in the affairs of the Corps."

Her Majesty was graciously pleased to make the following reply :

BUCKINGHAM PALACE,
1st July, 1953.

"I send you my sincere thanks for the kind message which you have conveyed to me on this occasion, on behalf of All Ranks of the Royal Army Medical Corps.

"It is with the greatest interest that I have heard of the 50th Anniversary of the founding of the JOURNAL, and I congratulate all those who have contributed to its success. To them, and to all its readers, I send my best wishes for its continuing service to the Corps."

ELIZABETH R.,
Colonel-in-Chief.

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A JUBILEE MESSAGE FROM LIEUTENANT-GENERAL SIR FREDERICK HARRIS, K.B.E., C.B., M.C., M.B., Q.H.S., D.G.A.M.S.

It is with great pleasure that I send this short message of "happy returns" to the Journal of the Royal Army Medical Corps on its fiftieth birthday. The Journal has for half a century been a source of pride to the officers of the R.A.M.C. ; indeed, its birth in 1903 was a reflection of the pride which the officers of the Corps felt in the Corps formation and in its professional standing. The Journal has during this time kept the work of the Corps before a wide audience of medical men at home and abroad. It has also been of the greatest use in presenting to the officers of the Royal Army Medical Corps those aspects of military medicine, including tactics and administration, which most closely affect them. It has thus been the means of helping to make our medical officers, whether clinicians or administrators, broadly-minded medical soldiers with an understanding of their brethren's work and problems.

The Journal has had its ups and downs ; and at the moment is going through a lean period. The period is lean not because insufficient material is being offered for publication—indeed, rarely has there been a time when more or better articles have been submitted—but because of financial stringency. Against ever rising costs of production, its income remains stationary ; and it has been found necessary to curtail publication to that of a quarterly Journal of fifty to sixty pages. It is unfortunately true that the more pages there are in the Journal, the greater is the gap between income and expenditure.

The Journal relies almost entirely for its existence on its subscribers, since its value in the commercial market is small ; and I should like to thank all those loyal supporters who have subscribed and contributed to it in the last fifty years. Without their help there would have been no Journal, and to them a deep debt of gratitude is due. In particular, I should like to pay my tribute to the Editors of the Journal over this half-century—to Firth, Bruce, Horrocks, Cummins, Will, Thompson and Neal—who have done so much to make the Journal the success it has been and is.

Finally, to the Journal itself I wish long life and prosperity ; and I am confident that it will continue to be, as it now is, an expression of a proper pride in our work as officers of the Royal Army Medical Corps and one of the firmest bonds of our corporate spirit.

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Vol. 99, No. 3, was issued on 8th April, 1953

Authors are alone responsible for the statements made and the opinions expressed in their papers.

Journal
of the
Royal Army Medical Corps

Original Communications

COLONEL SIR WILLIAM HEATON HORROCKS, K.C.M.G., C.B.

BY HIS SON

Lieut.-General SIR BRIAN HORROCKS

MY most vivid memory of my father is of a small, frail figure sitting in his armchair by the fire, with his white head bent over proofs—for ever working on his beloved Journal. He became Editor of the R.A.M.C. JOURNAL in 1908 and was actually preparing an editorial on the day of his death, 26th January, 1941; it must surely be something of a record for one man to have edited a Service Journal continuously for thirty-two years. For him it was a labour of love, because this was the tenuous link which kept him in touch with the Corps he loved, right up to the end of his life.

If home life has any influence on children, then my sister and I were indeed fortunate, because we were brought up in a thoroughly happy atmosphere, for my father and mother were a most devoted couple. Her death, caused largely by a strained heart which she acquired through helping to carry heavy patients in the local hospital during the First World War, was a grievous blow to him. Fortunately my sister remained at home and looked after him devotedly throughout the remainder of his life.

Even as a youngster I acquired a great respect for my father's judgment, and I now realize that he had one of the clearest brains of any man I have ever met. His advice invariably turned out, in the long run, to have been correct, and I only wish that I had had the sense to take it more often.

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The memories he has left with us are always of courage and patience and a high standard of integrity. His philosophy of life was a simple one. Once convinced of the right course to be pursued, nothing would cause him to swerve from it, whatever the effect on him personally. In the course of his research and scientific work he was often forced to take unpopular measures, but, since his ultimate goal was the welfare of the troops, no consideration of any sort was allowed to interfere. Popularity meant nothing to him. He met the limitations of old age and ill health with the same courage and patience, and as one active hobby after another was taken away from him he made no complaint but looked for something to take its place.

When World War II caught up with him, now an old man, he faithfully studied A.R.P. regulations and carried them out with meticulous care for the safeguard of his family. He constructed a scientifically perfect air raid shelter in the garden, but, needless to say, once construction was finished, never went near it and refused to leave his bed in those first air raids, reading quietly, undisturbed. So we remember him, courageous and patient to the end.

He was educated at Owens College, Manchester, whence he matriculated at the age of fifteen and took his B.Sc. After graduating in medicine, he took his M.B. in London in 1883. For a time he was a resident at the Brompton Hospital for chest diseases, and then went to the Guildford Hospital. It was here that he started riding, which was to be one of his chief hobbies for the rest of his life. In his later years he would often talk of the long pleasant hacks over the downs and Newlands Corner, and this was the picture of England which he always carried in his mind during his periods of service abroad. At this time he was all set for the life of a civilian practitioner, but a chance conversation with a patient turned his attention to the Army, and he joined the Royal Army Medical Corps, a step which he never once regretted.

As I am no scientist it is difficult for me to comment on my father's long and distinguished career in the Army, for though he started as a surgeon, passing out of Netley as a Surgeon Captain on 5th February, 1887, he gradually turned more and more to research and the scientific side, and in 1897 was appointed Assistant Professor of Hygiene to the Army Medical School at Netley. Then came one of the most important periods in his life, when he was posted to Gibraltar. We lived in a quarter called Paradise Cottage, hunted regularly with the Calpe Hounds, and he applied all his energies and research to the health conditions on the Rock. My only memory of his experiments is of the monkeys obediently turning their posteriors to the bars of their cages in order to have their temperatures taken. Then came Malta and the battle against Malta fever. This is history now, but we carry in our minds the picture of my father sweating night and day in the sticky heat of Malta, and the final crowning success of the discovery of the germ in the goats' milk. As a result, the scourge of this dread disease has been almost entirely eliminated from our Mediterranean garrisons ever since.

Space will not permit me to mention my father's publications, nor am I competent to do so, but they were many and varied. While Assistant Professor

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of Hygiene, he published his "Introduction to the Bacteriological Examination of Water," for long the standard work on the subject. He edited with Colonel Firth "Parkes' Theory and Practice of Hygiene" and the second edition of Notter and Firth.

In 1914 he became a King's Honorary Surgeon, and in 1915 was awarded the Chadwick Gold Medal and prize of £50.

It was, however, during the 1914-18 war that the supreme test was to come. For as a member of the Army Medical Advisory Board, member of the Army Sanitary Committee and Chairman of the Anti-Gas Committee, his activities covered a wide field, but to the layman his work can be summed up in two words, "Water" and "Gas." There is no doubt that thousands of lives must have been saved by his mobile water sterilizers, the mobile hygiene laboratories, by the water-carts in which he was responsible for many alterations, and, above all, by the "Test case for Water Supplies," which, incredible though it may seem, is still in use today, and is known as the "Horrocks Box." I shall never forget my embarrassment when, as a young officer attending a course at the School of Hygiene, I heard the N.C.O. saying to a large squad: "This 'ere is known as the 'Orrox's box, invented by Lord 'Orrox, the father of that young gentleman over there." It was some time before I succeeded in persuading my fellow students that Colonel Sir William Horrocks, *K.C.M.G.*, *C.B.*, was not a member of the Upper House.

My father was the most modest and retiring of men, and it was extraordinarily difficult to get him to talk about his work, but his greatest contribution to the war was undoubtedly made as Chairman of the Anti-Gas Committee. The story of the constant fight to provide adequate protection for our troops against the new types of gas which kept on appearing is an epic in itself. What pictures that word "Gas" conjures up in my mind! Instead of the stands of Tottenham Hotspur Football Club echoing to the roar of the North London football fans, they reverberated to the clicking of endless sewing machines, for it was here that thousands of girls constructed the British gas masks. Though the stands were roofed in and enclosed to provide a measure of protection against the weather, these young women would have worked in a snow-storm if necessary in order to provide the anti-gas protection for their boys overseas. My father ended the war with a profound admiration for the spirit of the women of Britain.

From time to time new formulæ would appear on his desk. Whence these came he had no idea, but they indicated that a new form of gas was likely to be used against us. The antidote had to be found, and on one occasion the formula was accompanied by a request that sufficient gas helmets to protect the front-line troops and artillery should be available in France by a certain date. All went well until it was discovered that the material was not sufficiently robust to stand up to the chemicals which had to be used to keep out this new gas. As time was getting desperately short, it was impossible to go through the usual War Office channels in order to obtain materials of the required strength. So my father took his own counsel and lorries were dispatched round all the towns in England to buy every available yard of a particular cloth. Even so, the helmets were forty-eight hours

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late in arriving, and it was during this period that his hair went quite white. He hardly slept at all, and every few hours went down to Hungerford Bridge to feel the direction of the wind. Luckily, during this vital period it never changed, and the Germans were unable to launch their gas until after the helmets had arrived. Unknown to the front line troops, this battle on the scientific front continued throughout the war, and it was my father's proud boast that as far as gas was concerned the defence was always one jump ahead of the attack.

There was one other activity which caused my father much worry during these war years, namely, the soldiers' rations. In view of the submarine warfare, efforts were always being made to reduce the ration, and so save shipping. He fought hard and, on the whole, successfully to ensure that the food allocated to the Army did not fall below what he considered to be the minimum calorific value.

Those war years were terribly exhausting, and I think he may be said to have earned his decorations, K.C.M.G., C.B., and two mentions in despatches. His final appointment before retirement could hardly have been more suitable, for in 1919 he became the first Director of Hygiene at the War Office.

When the time came for him to retire, he was glad to withdraw into the peaceful backwater provided by the Journal, his garden, and his books, for the war had sapped his strength. Nevertheless, in spite of much ill health, he had a happy and contented old age, looked after by his daughter Jean. I cannot do better than end with this short extract from his obituary notice, which was written by Brigadier Cowell in the *British Medical Journal*:

"Sir William was a great man, with a wide outlook, and an untiring devotion to detail. He retained his interest in the JOURNAL OF THE R.A.M.C. until the end, being entirely responsible for the editing of all the articles since the beginning of the 1914-18 war. He was a little, frail, sweet-tempered gentleman, old in years, but young in mind, living in the country, but in touch with the office of his beloved Journal at the War Office.

"Sir William has achieved the happiest of endings, dying in harness."

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RETROSPECT

BY

Lieut.-General Sir MATTHEW FELL, K.C.B., C.M.G., F.R.C.S.

[I asked Sir Matthew Fell to contribute what he would to our jubilee issue, as representing the few survivors of those who were serving when the first number appeared in 1903, and he has sent the note which follows. He adds, in a covering letter, that for thirty years he has been in favour of a combined services medical journal, and as Sir Matthew was in turn Director-General of Medical Services, R.A.F., and D.G., A.M.S., his opinion is entitled to consideration.—EDITOR.]

THE Editor of the Journal asked me to write something reminiscent for the July number. Where should one begin, and where end?

There can never, in the history of the world, have been a half-century which has seen such an upheaval, whether ideological, scientific, medical or military, of every aspect of the life of the nation. At one end, the slow lumbering wagon with its sixteen oxen, communication by messenger or heliograph, bully beef and biscuit, and a vast outbreak of typhoid group diseases. At the other, completely mechanized transport ; troops, detached or cut off, fed and maintained, and their sick and wounded evacuated by aeroplane ; radio and radar ; protective inoculation against epidemic diseases ; mepacrine, the sulpha drug series, and finally penicillin.

I was out with Lord Kitchener's column near Kuruman in Bechuanaland when the news of Queen Victoria's death reached us, and I well remember the general feeling in the air that something solid and stable had gone, leaving the world a different place. One felt it was the end of an epoch.

More than anything else, I suppose, the political implications on the Continent arising from the South African War, and the actual lessons of the war itself, brought about the reorganization of the army as a whole, and not least of the medical services. The move from Netley to London of the Army Medical School, the Corps Journal, the Q.A.I.M.N.S., and, above all, the acceptance by the staff of the War Office of the supreme importance of the teaching of Hygiene, all formed part of this reorganization. It was fortunate that the R.A.M.C. had actually serving at the time officers equal to the task. We must never forget the names of Alfred Keogh, organizer and administrator ; of William Horrocks and all the work he did for Field Hygiene ; and of William Leishman, who had been Almroth Wright's assistant in the Pathology Laboratory at Netley and who, by quiet but genial insistence, put through the experiment of sending Trooping Season Battalions to India inoculated against typhoid fever, the spectacular results of which killed all opposition at one blow.

At a later stage, when the changes in the staff of the army and reorganization of the system of supply and transport and of the ordnance services had come into

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force, much thought and consideration was given to the method of tactical employment of field medical units, clearing of casualties, and so on. Of those with whom I was personally in touch, I feel that the names of H. E. R. James, William Macpherson and Charles Burtchaell should be recorded as having influenced thought on how the medical services could be of the greatest value to the army if we became involved in a European war.

These men had read in detail the Commissions of Enquiry into the medical services which were appointed from the Crimea to the South African War. They were well acquainted with Otis on the American Civil War, and with all that was available on the existing medical organization of continental armies.

Now officers of the Corps have 600 numbers of the Journal to see, in which they can find articles dealing with the changes in thought, the practical experiences, which brought about the various changes, whether in administration or tactical employment of medical units in the field, and read of the results of the teachings of these men and their successors.

It is no longer necessary to go back to the Crimean War!

THE JOURNAL, 1903-1953

"The written word alone flouts destiny,
Revives the past, and gives the lie to death."
HELEN WADDELL: *The Wandering Scholars.*

"IT is surely much to be regretted, that notwithstanding the numerous wars in which Britain has been engaged in all parts of the world, and the number of well-educated, intelligent, and active medical officers who have been employed in those wars, the greater part of the knowledge acquired has hitherto been allowed to remain, and even to perish, with its possessors. The value of the information contained in the results of the few official details of the diseases of the army and navy which have been published during the late war must increase this regret, and make us realize how much the general stock of medical knowledge might have been augmented had those enjoying similar opportunities with the authors of these collections been animated with an equal zeal for their profession."

So wrote John Thomson, Regius Professor of Military Surgery in the University of Edinburgh, in his *Report of Observations . . . in Belgium after . . . Waterloo* (Edinburgh, 1816). A little later, J. G. van Millingen, in his *Army Medical Officers' Manual upon Active Service* (London, 1819), suggested the formation of clinical societies among medical officers in the larger stations, the papers read before them to be submitted to a central authority which would choose the best of them for publication in an annual volume. This suggestion might have been expected to appeal to Sir James McGrigor, to complement the library and museum which he had already initiated, but apparently it did not, and in 1848, the *British Army Despatch* (Vol. I, p. 313, 20th November, 1848) comments:

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"The many admirable manuscripts which have from time to time been forwarded to the Medical Board Office by officers, the receipt of them has been merely officially acknowledged, and the contents either 'burked' or thrown into a dusty corner . . . The department—one of the first in the kingdom—has no 'Quarterly Transactions,' as we find emanating from the Royal Society, the Statistical or the Archeological. . . . But these things will never occur until root and branch—the thicket of stubble—be removed, and a fair field and cultivated soil replace the sandy desert—the dominion of the self-aggrandizing medical department."

Again, in 1849, Henry Marshall,* the "Father and Founder of Military Medical Statistics" and a retired Deputy Inspector of Hospitals, published a seven-page pamphlet† in which he pleaded for the establishment of a periodical of British military medicine, contrasting our lack of one with the practice of the medical departments of foreign armies. Sir James McGrigor had stimulated the production by officers of the Army Medical Department of elegant atlases of anatomy and pathology, but he remained deaf to suggestions for the establishment of a journal.

It was, in fact, somewhat on the lines foreseen by van Millingen that military medical reporting first developed in Britain. In 1859 was begun the series of *Reports of the Army Medical Department*, in which it became customary to print, in addition to the statistical tables, the reports of the Principal Medical Officers of expeditionary forces, and also independent papers on medical subjects, though Sir William Taylor (Director-General, 1901-1904) entertained no high opinion of this means for the propagation of knowledge : ". . . all communications, however great their interest, were consigned to the limbo of the *Army Medical Department Report*. Some lethal influence seems to have lurked in the pages of that official publication, for everything that entered them was suffocated at birth and annihilated. No future existence was possible for anything overtaken by that misfortune."

An independent commercial venture was the publication in 1864 by Messrs. J. & A. Churchill of *Annals of Naval and Military Medicine*, Vol. I, a collection of extracts from the "mass of information scattered in bulky official papers and in a variety of periodicals at home and abroad." The anonymous editor collected his material while he was on sick leave, and apparently no successor was found, for the first volume was also the last.

In 1864, too, the staff of the Army Medical School had arrangements for the publication of a journal completed to the last detail, only to have them annulled by "old-fashioned officialdom and the rules and customs of the service," and Surgeon-Major Evatt's appeal in a pamphlet‡ published in 1885, drew no better response.

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* D.N.B. **36**, 237 ; and John Brown's *Horae Subsecivae* (Edinburgh, 1858), chapter on "Dr. Henry Marshall and Military Hygiene."

† "Suggestions for the Advancement of Military Medical Literature, with Observations on Military Hygiene." (No place, no date.)

‡ "A Proposal to form an 'Army Medical Institution' on the lines of the Royal Artillery Institution and the Royal Engineer Institution." By Surgeon-Major G. H. J. Evatt. Woolwich, 1885. Printed for private circulation.

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It remained for Sir William Taylor to add to the lasting obligation under which he placed every officer who has since served in the Corps, by founding the Journal. In the first number (July, 1903) he wrote "L'Envoi" for the new venture, and after describing its origins and defining its objects, he said : "It surely can be relied on that there will be no lack of either earnestness or enthusiasm; that not a single officer will forget his responsibility for the complete success of the Journal."

As its first editor, he chose Major (later Colonel Sir) Robert Firth, Professor of Hygiene at the R.A.M. College, who, in his own words, had "a weakness for writing." Others must have thought it his strength, for although he edited only the first volume, he contributed wit and wisdom to our pages for the next quarter of a century. Despite the passage of fifty years, and the straitened circumstances which now surround the Journal, Firth laid his foundations so well that he would still recognize his handiwork in these pages.

Firth was succeeded, for four years (1904–1908), by Colonel (afterwards Major-General Sir) David Bruce, one of the finest scientists who ever served the Corps. Some of the papers which he contributed and elicited have a lasting value in medical literature.

On Bruce's resignation, the Journal came into the hands of the man who was to rule it from before the first World War until well into the second—Major (later Colonel Sir) William Horrocks. From 1908 until 1941, for more than half the life of the Journal, he edited it critically and affectionately—he is said to have been reading manuscript for it on the day of his death ; and though his craftsmanship was apparent to none but his authors, the value of their writings was materially enhanced by his enlightened editing. Any who would pay tribute in our jubilee year to his thirty-three years of devoted service in the editor's chair should turn back to our issue of February, 1941, and join with those whose mourning was turned into a good day in contemplation of his labours.*

Sir William's place was hard to fill, but for the remainder of the war years, until 1945, it was handsomely filled by Colonel Lyle Cummins, an authority upon tuberculosis of world-wide reputation, who had come back from retirement to work in the War Office, collating material for the medical history of the war. Colonel Cummins, as a serving officer, had been professor of pathology at the R.A.M. College, and his appointment maintained the regular alternation of editorship between hygienist and pathologist which, except for the five years of Colonel Cummins' successor, has obtained throughout the Journal's existence. Colonel Cummins, during the war years, served as no officer on the active list could have done as a stable focus for the Journal's activities, as indeed did Colonel G. W. Will, editor from 1945 to 1950.

During this period of post-war decline, it would have been almost impossible to find a serving officer with the necessary qualifications who could be promised a sufficiently long tenure of an appointment to make his selection as editor worth

* Elsewhere in this issue will be found an engaging memoir of Sir William, generously contributed by his son, Lieut.-General Sir Brian Horrocks, K.C.B., K.B.E., under whom many of us were proud to serve in the Western Desert or in Germany.

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while. In addition, Sir William Horrocks and Colonel Cummins had together founded a tradition of editorship by a retired officer. Colonel Will had to face unprecedented difficulties, due in part to the cessation of the grant of regular commissions during the war. Young officers were no longer encouraged to subscribe to the Journal as a matter of course, out of loyalty and as a continuing part of their training as military medical officers, while, by reason of the financial stringency, many old subscribers, living on ever-contracting pensions or with increasing commitments in an ever more expensive world, found themselves unable to continue their support. All the time costs were rising. Contributions, once flowing freely, were found with difficulty, for in a diminishing army bearing the heavy training burden which National Service created, officers were less inclined to devote their leisure to exacting literary disciplines. So it happened that not even Colonel Will's devoted efforts were sufficient to restore the Journal to its former prosperity.

Colonel Will's successor, Lieut.-General Sir Treffry Thompson, during his two years of office, maintained the high literary standard, but financial stability seemed unattainable. The merging of the Journal in a joint publication for the medical branches of all three Services, Royal Navy, Army and Royal Air Force, was actively considered, only to be rejected. The possibility of completely discontinuing publication, which month by month, in peace and war, had never failed since July, 1903, was seriously contemplated. But other counsels prevailed.

By issuing quarterly numbers, of a size strictly covered by income, and by effecting every possible economy in management, the Journal has survived to see, if not actively to celebrate, its fiftieth birthday. It is impossible, even if it were desirable, to sell the Journal in a commercial market. Its future is in the pockets of every serving officer, whether regular, short service, Territorial, A.E.R., or National Service, of our retired officers, and of those who in time of war have found enjoyment as well as the fulfilment of their duty in the R.A.M.C. Our readers know them, and they can help us.

Laborare est orare: ora pro nobis.

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CARCINOMA OF THE ADRENAL CORTEX CAUSING FEMINISM IN AN ADULT MALE

BY

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AND

Lieut.-Colonel R. S. VINE

Royal Army Medical Corps

SEVERAL well-known clinical syndromes are associated with carcinoma, adenoma or hyperplasia of the adrenal cortex, but that of feminizing changes in the adult male is very rare. The following is a report of such a case, in which also the giant size of the tumour is worthy of note.

CASE REPORT

History

Male, aged 47, an army officer, married. At examination for life insurance a large swelling had been discovered on the left side of the abdomen, of which the patient had been quite unaware. He was admitted to hospital in September, 1950, on a provisional diagnosis of an enlarged spleen.

He had always been fit and athletic, did not admit to any complaints, and had not suffered from any serious illnesses or accidents. It was, in fact, difficult to obtain a satisfactory history from him, and some of the details were only obtained later from his wife. There were two children, a daughter born in 1928, and a son born in 1945.

After returning from India in 1947, he put on weight and his wife noticed that his breasts were slowly enlarging, the left more than the right. His sexual appetite became gradually but completely lost, whereas formerly it had been quite normal. Early in 1950 he experienced a few attacks of severe abdominal pain and sickness, but he paid little attention to them and did not consult a doctor.

On Examination

External Appearance.—He was moderately stout, the adiposity having a distinctly feminine distribution and the "mons veneris" being especially prominent. The breasts were very large for a male and were pendulous. The

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penis was fairly normal in size, but the testes were only about one-third of the normal size. He had always been fairly hirsute and the distribution of hair was of the normal masculine type ; there had been no recent alteration.

Abdominal Examination.—There was no complaint of pain, tenderness or even discomfort on examination of the abdomen. On palpation, a very large firm mass was made out protruding from underneath the left costal margin and extending downwards in the flank and forwards towards the umbilicus. The inferior pole was round and smooth, there was no splenic notch, and posteriorly it filled up the left renal angle, being easily palpated bimanually. It was completely dull on percussion, the stomach and colon being displaced medially by it. The impression was that of a massive, solid tumour.

Physical Examination otherwise showed no points of interest. The blood-pressure was 140/90. Examination of the blood and urine showed no abnormality, and there was no evidence of any condition which might be associated with splenic enlargement.

Biochemical Tests.—Unfortunately, no estimation was obtained of urinary androgen and œstrogen excretion.

Radiological Examinations

Intravenous Pyelogram.—There was no concentration of the dye by the left kidney, but normal function on the right.

Cystoscopy and Retrograde Pyelogram.—Cystoscopy showed a normal bladder ; both ureters were catheterized. There was a brisk flow of urine from the right kidney, but only a very small amount from the left. On the right side a normal pyelogram was obtained ; on the left the kidney was low, the upper end of the ureter and pelvis were distorted as by pressure from above, and there was incomplete filling of the calyces.

Barium Meal.—The stomach was normal, though displaced medially and forwards.

Chest.—There was a moderate degree of elevation of the left half of the diaphragm, but no other abnormality.

Diagnosis

The full significance of the state of the breasts and testes had not then been appreciated and the probable diagnosis seemed to be a retroperitoneal tumour or a large tumour of the kidney.

Operation

A long curved transverse incision was made below the left costal margin, carried posteriorly into the loin as in a kidney exposure, and anteriorly almost to the edge of the rectus abdominis. On retroperitoneal dissection, a huge, smooth, lobulated mass was encountered, but, in order to improve the exposure, it was necessary also to incise the posterior parietal peritoneum lateral to the

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colon. The mass was intimately attached to the upper pole of the left kidney, but after dividing the renal pedicle it was discovered that the tumour was not growing from the kidney, being merely adherent to and distorting it ; the kidney was thus removed separately.

The mass was next found to occupy the whole of the left cupola of the diaphragm and to stretch to the mid-line, but, after division of many vascular adhesions and by blunt dissection, it was eventually freed and delivered into the wound. A fairly narrow pedicle was ligated and divided deeply in the wound, and what appeared to be the entire tumour, a mass weighing 6 lb., was removed. On further inspection, a portion of the tumour, about the size of a normal kidney, was found to have been left behind near the mid-line, and it was hoped to be able to excise this also. On gently handling it on two occasions, however, the blood-pressure fell most alarmingly, but recovered at once on desisting. Any further attempt had to be abandoned and the operation was concluded.

Post-operative Condition.—Considering the severity of the operation, the patient was remarkably well at first. During and after the operation he received four pints of blood and thereafter intravenous saline was continued, together with Eucortone injections. Sudden deterioration took place fourteen hours after the operation, and death occurred four hours later.

Pathology

Post-mortem Examination.—As permission to perform a complete post-mortem had not been obtained, the operation wound was reopened some eight hours after death and the abdominal contents removed through it. The wound was healthy, clean and well-knit. The deeper layers were adequately and firmly stitched ; there was no "dead-space" in the abdominal cavity, the plentiful supply of extrarenal fat making efficient packing-material. A piece of tumour which had extended over the mid-line to the right side, lying against the bodies of the vertebræ and about the size of a normal kidney, was removed. The right kidney was found to be healthy, but the right suprarenal was much reduced in size (3.1 g., as against the normal 5-6 g.) and largely autolysed.

The spleen was enlarged and distorted (284 g.). The liver was normal in size and showed at least two deposits, circular, and about half-an-inch in diameter. Numerous enlarged glands were scattered throughout the root of the mesentery, some of which resembled tumour tissue on naked-eye inspection of cut sections. The heavy build with feminine distribution of fat, especially marked in the breasts and supra-pubic pad of fat, was noted and the atrophic size of the testicles was also remarked.

Naked-eye Examination.—The tumour was shaped like a small rugby football, some 21 cm. in its longest diameter. It was largely encapsulated, but penetration into the surrounding tissues had occurred at some points. The cut surface was not unlike a hypernephroma in appearance, the general colour being orange-yellow. There were circumscribed masses of creamy colour varying in size from 7.5 cm. downwards. There were also darker areas of hæmorrhage, and the surface generally was friable (Fig. 1).

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Histology.—The lobulated nature of the tumour illustrated in Fig. 1 is confirmed under the low power, the lobules being separated by fibrous septa. Under high power, the tumour cells present a most remarkably irregular and bizarre appearance (Fig. 2). In the most differentiated areas the cells are arranged in columns resembling closely those of the zona fasciculata. This is better illustrated in the sections stained by Vines' method (Fig. 3) in which cell outlines

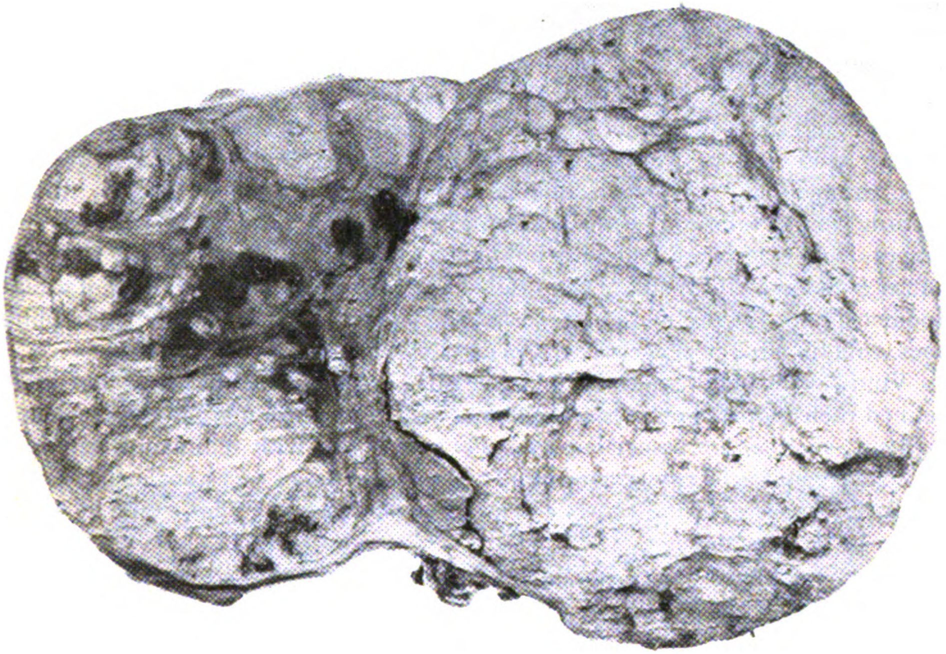

FIG. 1.

are more clearly defined. It can be seen in some of the sections that these areas surround arterioles. Other sections reveal lobulated sheets of cells of varied sizes separated by bands of fibrous tissue. These sheets of cells have no special arrangement and, in them, blood-vessels are conspicuous by their absence. Red blood cells are plentiful enough in clefts between cells ; in fact in some of the lobules large hæmorrhages are evident, and these are associated with areas of necrosis. Blood-vessels, many compressed, are numerous in the inter-lobular fibrous septa. Sections of some parts of the tumour mass are so strikingly different from others that were this not evident on the same slide in some cases, one might be deceived into concluding they were in no way related. For example, the appearance in one portion of a particular section is that of a simple hypertrophy of a fairly normal-looking zona glomerulosa, i.e., the cells, which are of normal

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polyhedral appearance, are broken up by rather wide spaces into rounded groups, some of which tend to an acinar arrangement. There are isolated collections of lymphocyte-like cells, and some more scattered ones amongst the normal-looking cortical cells. As one moves across the section the spaces separating the groups of cells become progressively wider, red blood cells appear, the cortical cells become more broken up and ragged in appearance and finally one comes to a pale eosinophilic necrotic area of ghostly structure. Separated from the relatively normal cortical field by a thin fibrous band is a denser collection of smaller and more deeply basiphilic cells in which an arrangement resembling any normal cortical feature is difficult to define. These cells are comparatively uniform in size, about the size of a large lymphocyte, and have more numerous mitotic figures than in other parts of the tumour. Some of the nuclei are more bunched up and there is a suggestion here and there of circular acinar formation. In another section from a different part of the tumour, a lobule of fairly uniform cells arranged like a normal zona fasciculata is separated by a thick fibrous septum from a lobule of similarly arranged cells of strikingly varied sizes and shapes. Some of these cells are of dimensions approximately $60\mu \times 50\mu$ with nuclei of at least $20\mu \times 30\mu$. Many cells have an appearance suggestive of a high lipoid content. Many of the larger nuclei, particularly the more chromophilic ones, contain large oval vacuolated spaces.

Vines' stain shows that the cytoplasm is diffusely fuchsinophil, but well-defined fuchsinophil granules are lacking (Fig. 3). No granules of golden-yellow pigment, such as are associated by some authorities with feminizing tumours, were seen, and Perls' reaction reveals free iron in only an occasional cell. Lendrum's phloxine-tartrazine shows a few phloxine-positive bodies, some of which appear to be intranuclear.

The liver deposit resembled the more bizarre portions of the main tumour.

Discussion

Clinical Classification

A useful classification of the clinical syndromes produced by adrenal cortical tumours has been given by Cahill, Melicow and Darby (1942), as follows :

(1) No recognizable hormonal changes.

(2) Changes due to excess of androgens :
- (*a*) In female child towards adult masculinity.
- (*b*) In female adult towards masculinity.
- (*c*) In male child towards adult masculinity.

(3) Changes due to excess of œstrogens :
In male adult towards feminism.

(4) Changes due to excess of androgens and other steroids :
Cushing's syndrome with associated sexual changes, usually in females.

(5) Changes due to excess of other steroids related to metabolism :
Cushing's syndrome without sexual changes, in males or females.

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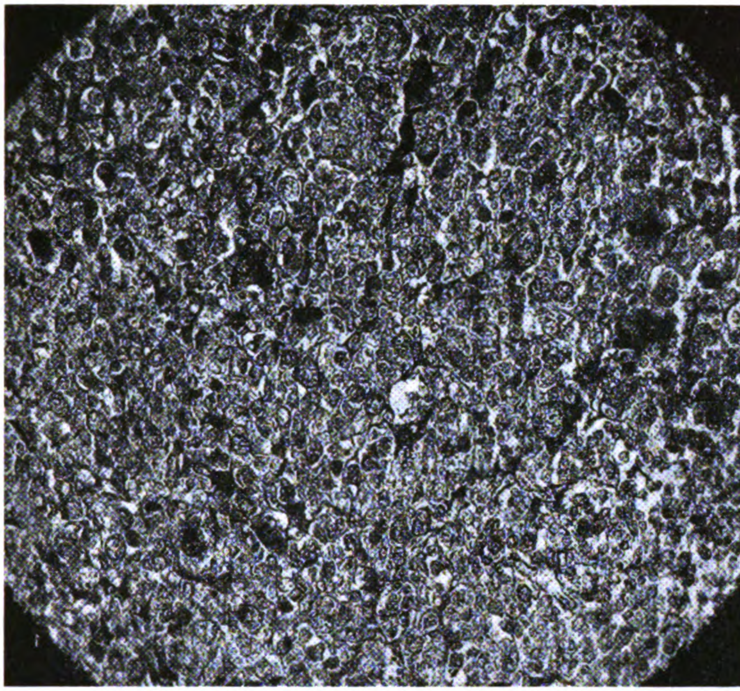

FIG. 2.

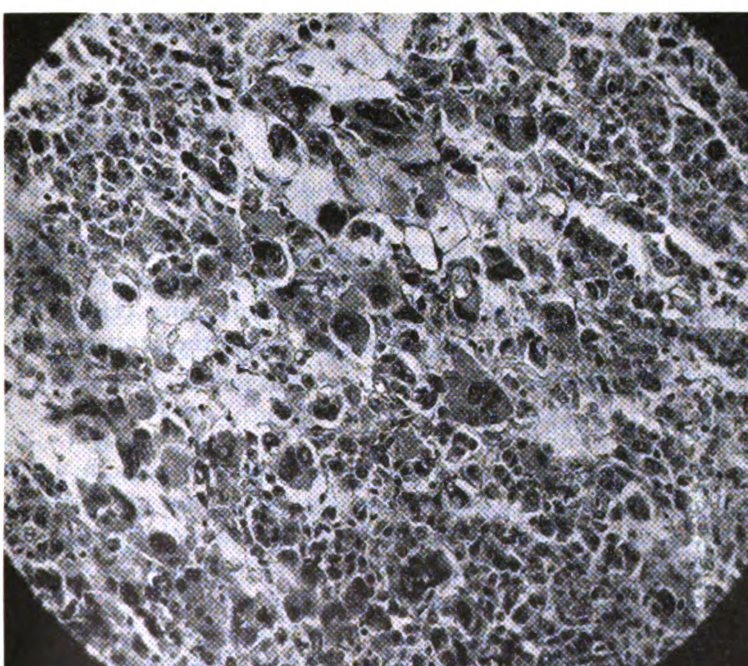

FIG. 3.—VINES' STAIN.

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It may be noted that there has not been a recorded instance of Cushing's syndrome associated with feminism in the male adult. There has been one published case (Wilkins, 1948), of feminizing changes in a male child. To the above may be added the possible relationships to precocious puberty in a female child and also to various pluriglandular syndromes.

General Clinical Picture of Feminism in Adult Male

Although few cases have been recorded, the clinical picture is striking and remarkably constant. The onset is insidious, with tiredness an early complaint, and there is usually a history of slow but progressive changes over a period of from one to three years. The most outstanding features are loss of sexual desire and potency, both previously being normal, progressive atrophy of the testicles and gradual enlargement of the breasts. Clinical examination always reveals a large abdominal tumour protruding from below the costal margin. There are no significant changes in the blood-pressure.

Pyelography demonstrates a downward displacement of the kidney with distortion of the renal pelvis ; there is little or no excretion of a dye, and the calyces fill very imperfectly on retrograde injection. The urine is normal except for a high excretion of œstrogens ; there is no hæmaturia.

Operation may be carried out, but more often than not to no purpose, death occurring soon after excision of the tumour, or the tumour being irremovable. Some cases have survived excision only to die of metastases a year or two later ; the only assumed cure was in the second case of Holl (1930), but the follow-up was only for twelve months. Metastases in the liver, retroperitoneal glands, lungs and other sites are almost universal and may already be present at the initial clinical examination, prohibiting operation. The rate of growth is variable, most often being rapid after an insidious onset. The prognosis is therefore very grave, as it is in other syndromes caused by carcinoma of the adrenal cortex.

Certain other features have been noted in individual cases, such as increasing obesity (Simpson and Joll, 1938), lactation (Parkes Weber, 1926 ; zum Busch, 1927 ; and Lisser, 1936), and decreased growth of the beard, with restoration to normal after operation (McFadzean, 1946). After operative removal of the tumour there was fairly rapid recovery of sexual desire (Holl—second case, Simpson and Joll, McFadzean), with increased size of the genitalia and decreased size of the breasts in the last instance.

Hormonal Excretion Studies

These have been carried out in few of the recorded cases, but, according to Armstrong and Simpson (1948), the essential features are a gross excess of œstrogens and a moderate or slight excess of androgens in the urine. In association with the recognized clinical picture, an excess of œstrogens in an adult male should make the diagnosis of carcinoma of the adrenal cortex quite certain, with the added implication of metastases being already present.

In the case of Roholm and Teilum (1942), the excretion of œstrogens in the urine attained a level of 5,000 mouse units, instead of the normal of about 20,

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metastases being then noted. In the case of Simpson and Joll (1938), no estimations were made originally but, after removal of the tumour, the excretion of both œstrogens and androgens was less than normal for several months. Subsequently, with the final decline in the clinical condition, there occurred an excessive excretion of œstrogens, this being the first evidence of metastases. McFadzean (1946) recorded that the Friedmann pregnancy test was positive before the operation, but became negative twenty-one days after the removal of the tumour. No other reported case has demonstrated a positive pregnancy test.

In the unpublished case of Scott (quoted by Wilkins, 1948), the estimations were paradoxical, although the typical syndrome of feminism was present. In this instance the œstrogen excretion was only slightly above normal, but the androgen excretion was high before operation, falling to about normal after removal of the tumour. According to Frank (1942), excessive excretion of œstrogens may occur in cases of carcinoma of the adrenal cortex without feminizing changes. In his series only one patient was a male, but no clinical details were appended ; the others were females either with Cushing's syndrome or without endocrine changes. An excellent review of œstrogen/androgen secretion studies in diseases of the adrenal glands has been made by Kepler and Keating (1941).

Previous Cases of Feminism in the Male

The following is a list of the authors of previously recorded cases, and, unless otherwise stated, the typical clinical and pathological features had been present.

(1) Bittorf (1919) and Matthias (1922). Age 26. No operation. Widespread metastases at autopsy.

(2) Parkes Weber (1926) and zum Busch (1927). Age 27. No operation. Widespread metastases at autopsy.

(3) Parkes Weber (1926). Age 26. No operation. Widespread metastases at autopsy.

(4) Holl (1930). Age 15. Operation performed but tumour irremovable. Patient died after operation.

(5) Holl (1930). Age 44. Operation successful. Cure twelve months later, but not followed up longer.

(6) Lisser (1936). Age 33. Metastases present when first seen.

(7) Simpson and Joll (1938). Age 32. Operation successful and followed by temporary clinical improvement. Death two years later from metastases.

(8) Kooymann (1940). Age 29. Operation performed but tumour irremovable. Died next day.

(9) Pico Estrada (1940). Age 30. Death from metastases.

(10) Pico Estrada (1940). Age 41. Death from metastases.

(11) Roholm and Teilum (1942). Age 44. Metastases present when first seen.

(12) Cahill *et al.* (1942). Age 53. No large abdominal tumour palpable, but enlarged right adrenal revealed on air insufflation. Case not followed up.

(13) McFadzean (1946). Age 29. Operation successful but follow-up for only two months.

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(14) Armstrong and Simpson (1948). Age 42. Operation attempted but tumour irremovable. Death from metastases.

In addition to the above cases, it seems desirable to consider three others in the same category.

(15) Cahill *et al.* (1942). Under the classification of "tumours with no recognizable hormonal changes," their third case was that of a man aged 36 in whom there was loss of sexual vigour, although previously virile. Operation was successful but metastases were present two years later.

(16) Wilkins (1948). A boy aged 4 years 8 months when first seen. Both breasts were of the adult female type, having enlarged progressively between the ages of six months and two years. The prostate was enlarged and a slight excess of œstrogens was excreted in the urine. Abdominal exploration revealed a slightly enlarged right adrenal, which was removed. An adenoma was demonstrated and there were no metastases. During the next four years growth and general health were normal and the breasts decreased in size, slowly and progressively: the prostate became smaller. This is the only recorded case of a feminizing tumour occurring in a male before puberty, but it differed from all the others in being due to an adenoma, not a carcinoma.

(17) Staffieri, Cames and Cid (1949). Age 25. Pluriglandular features were present, enlarged breasts, attacks of hypoglycæmia, a nodular goitre and enlarged liver and spleen. A malignant tumour of the adrenal cortex was removed and thereafter all the above features disappeared. The patient was in excellent health two years after the operation.

Large Adrenal Cortical Tumours in General

Very large adrenal cortical tumours may be associated with various endocrine features, or without them, or with Cushing's syndrome. Tumours associated with Cushing's syndrome have been much more frequently reported, but the clinical and pathological features and progress of all these tumours are remarkably alike. The lack of complaints by the patients, the large, solid abdominal tumour, the typical pyelogram, the operative risks and the almost invariable development of metastases are not specific for one particular syndrome.

Lumb (1950) gave an account of two cases without endocrine effects, and Cahill *et al.* (1942) recorded others. Stevens (1923), Gibson (1927), and Loeb (1941) have also reported such cases, and, without attempting a comprehensive account, tumours without endocrine effects are rare.

Virilizing changes are undoubtedly the most common, whether due to carcinoma, adenoma, or simple hyperplasia of the adrenal cortex.

The size and weight attained by some of these tumours is astonishing and there are few solid tumours, apart from uterine fibroids, which give rise to such massive abdominal swellings. The largest on record is 20 lb. in Thornton's case quoted by Richards (1905). Those reported by Lumb (1950) were 5,350 g. and 3,750 g. Roholm and Teilum (1942) recorded a weight of 2,650 g. and Broster

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(1950) noted a weight of 2,500 g. in a female case in whom hypertrichosis was the predominant feature. In the present case the combined weight of the tumour removed at operation and the remaining portion removed at autopsy was 2,640 g. The smallest size on record appears to be that of "a large walnut" reported by Guthrie and Emery (1907).

Post-operative Dangers

The development of acute adrenal insufficiency immediately or soon after the operation is a risk inherent in any operation on an adrenal cortical tumour. The severity of the shock may be dependent on the state of the opposite adrenal gland, which is liable to have become atrophic. This point is commented on by Kepler and Keating (1941) in their exhaustive review of diseases of the adrenal glands. It should be possible to anticipate the risks before operation, the most important steps being the administration of sodium chloride and sodium citrate, and of desoxycorticosterone, started before the operation and continued afterwards. This treatment should be maintained for several days after the operation until the remaining adrenal gland has had time to regain its functional capacity.

Cahill *et al.* (1942) consider that these dangers occur after operation only in Cushing's, and not in other, syndromes. Most authors, however, disagree with these views and believe that the dangers are considerable in any of the syndromes. Convincing support for this is suggested by the histological studies of Glynn (1921) and will be referred to in the subsequent discussion.

The present case certainly emphasized the risks both during and after the operation.

Discussion on Pathology

In his classical paper of 1912, Glynn distinguishes a group of malignant adrenal cortical tumours which he refers to as "adrenal hypernephromata." These in general have certain characteristics in common—viz., fairly large size (see above), lobulated and fairly well defined with a thin but strong fibrous capsule, and a much variegated appearance on section due to hæmorrhages and necrotic areas, the predominating colour being yellow ochre. Microscopically the cells are arranged in columns resembling the structure of a zona fasciculata, but the greatest diversity of appearance may occur, from a fairly orderly picture of acinar arrangement (considered by Glynn to suggest hyperplasia rather than neoplasia), as in Bulloch and Sequeira's (1905) case, to an apparently disordered anaplastic mass of polygonal cells, multinucleate giant cells and large numbers of small cells with a single nucleus, as in Ritchie's case described in Bulloch and Sequeira's paper. The type of the latter was said to be a sarcoma, but the clinical effect was to accentuate female characteristics in an immature girl of 4, and from the histological description it appears to correspond with our case.

Although Glynn concludes from his Table I that the adrenal hypernephromata accentuate male characters in immature females, it appears that sometimes a precocious development of *both* characters occurs (e.g., Bulloch and Sequeira's case with hairy chin, big breasts and menstruation; Tilesius's case

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(quoted by Linser, 1903) of hairy pubes and big breasts; Ritchie's case (referred to above). Even in his first case (Dun and Glynn, in the 1912 paper), Glynn states that the child, aged 5, had the appearance of a girl "abnormally tall, about the age of puberty." She had a moustache and never menstruated. The description of the microscopical appearance could be applied equally well to our case, as also, be it admitted, could the histological description of Guthrie and Emery's (1907) case of an obese boy of under 5 who had had hairs on his face and pubes for three years and had a tumour the size of a walnut in contact with one kidney.

The same cannot be said of the cases in Table II of Glynn's (1912) paper. These are cases displaying some male characters in adult females associated with adrenal hypernephromata of which the histological appearances are but scantily described. The cases described in Table III, however, in which male sex characters occur in adult females with *hypertrophy* of the adrenals, are of considerable interest. It would appear that mere enlargement of the adrenals leads to an accentuation of *male* characters, at least in the majority of cases so far recorded.

It is not surprising that such varieties of histological appearance and of sexual manifestations as may occur in structural alterations and aberrations of the suprarenal cortex should have given rise to much confusion in the past. The arguments for the assessment of the nature of these tumours are ably considered by Glynn, who comes to the conclusion that there is no essential difference between the various patterns of "adrenal hypernephromata." The fact that these may revert to a primitive mesoblastic ancestry has to be borne in mind in order not to confuse them with sarcomata which do not lead to sexual changes. The fact that such apparently primitive and even anaplastic growths appear to produce a functioning secretion suggests that the production of sexual hormones is phylogenetically an ancient function, a not surprising characteristic.

It is of course possible that hormones so produced may be abnormal ones, as described by Kepler (1935). Nevertheless, the fact that true adrenal hypernephromata can occur with little or no sexual changes is stressed by Glynn, and the two cases described by Lumb (1950) provide further evidence of this. The malignant nature of the two latter cases appears to be somewhat in doubt, and histologically certainly differs markedly from our case. Glynn (1921) points out how little the histological appearances of the (adrenal) hypernephromata are an index of their malignancy, or indeed that any real histological differences exist at all, whether they occur in young or old, in males or in females, with or without sexual changes. More recently Broster and Vines (1933) introduced a staining technique to demonstrate over-activity of the adrenal cortex. Professor Vines has kindly looked at our sections stained by his technique and showed one of us (R. S. V.) his cortical sections from a case of adrenal virilism for comparison. The difference was quite striking in that the stained material in his sections was a brighter red and much more concentrated, whereas in ours it was much paler and more diffuse. These findings appear to agree with those of Dr. Joan Ross, quoted in Simpson and Joll's (1938) paper in comparing their case of feminism in a man of 34 with Dr. Dorothy Hare's case of masculinization in a woman of 34.

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There would appear to be undoubted evidence that the *functional* differences of *structurally* similar tumours can be detected by purely histological techniques on extirpated tumours, and an attempt has been made to illustrate this by Goormaghtigh (1940). An advance in the clinical diagnosis of adrenal cortical tumours and hyperplasia has been made by Patterson (1947) in devising a urinary colour test, and an application of this test is described by Broster and Patterson (1948).

Summary

A case of feminizing malignant adrenal cortical tumour with metastases in a man of 47 is described. This is believed to be the fifteenth recorded case. Its true nature was unfortunately not recognized until after removal. The clinical history is typical of that described for previous cases.

Acknowledgments

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ARMY BARRACKS IN THE UNITED KINGDOM: A BRIEF REVIEW OF THEIR GROWTH AND DEVELOPMENT

BY

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Introduction

British Army Barracks erected within the last twenty years may well be regarded as the unmarried soldiers' "Ideal Home." Their siting, design and construction have all been based on sound scientific principles in accordance with the current theory and practice of the hygiene of buildings. Intended primarily as a home, they conform to the modern trend in public health which considers suitable housing as one of the main factors in the maintenance and promotion of physical and mental health, and accordingly they incorporate all those amenities which contribute so much to the soldier's welfare and morale. Airy, well-lit barrack rooms, sitting rooms and canteens, drying rooms and cleaning rooms, barber's shops, gymnasia, swimming pools and playing fields—not to mention such essential requirements as artificial heating, modern sanitation, provision of hot water, up-to-date cooking facilities, etc.—all have become accepted by official authority as integral components of the soldier's present-day permanent accommodation.

But it was not always so.

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Three centuries ago the very idea of permanent barracks was unknown. A hundred years later it had begun to spread, but was looked on with such disfavour by the general public that no government dared put it into execution, with the result that soldiers had to remain content with billets in taverns and public-houses. By 1853 the British Army had been installed in permanent barracks specially constructed for that purpose, but the accommodation provided was so primitive that the Royal Commission on the Sanitary State of the Army, reporting in 1858, declared that "a soldier's barrack room at present has not the least pretension of the comforts of an ordinary dwelling-house, and, what is infinitely more disgraceful, there is not even the attempt made to introduce into it the decencies of civilized life."

Well may the ghosts of Marlborough's and Wellington's soldiers look with awed incredulity on the spacious buildings where some of their successors live today !

I

In pre-Restoration times soldiers found their accommodation by the simple expedient of entering whichever private dwelling was found suitable. It was not considered necessary to request permission from the owner, or to compensate him in any way.

When the Standing Army was formed in 1660, the soldier's pay was intended to cover all expenses, and he was therefore expected to make his own private arrangements for board and lodging, and to pay for them out of his own pocket. This naturally resulted in a wide dispersal of troops, since they were allowed to lodge wherever their fancy took them. But with the gradual evolution of the regimental system, it was found increasingly necessary to ensure that men belonging to the same regiment should keep together as much as possible in order that they might be easily located and made available at short notice. It was this need of controlling the soldier's whereabouts which gave rise to the practice of billeting, for it enabled a regimental commander to lay down exactly where his men would be quartered.

From the very earliest days, the question of the lodging of troops had been the cause of endless friction between the civilian population and the Army. The ordinary citizen objected most strongly to being compelled to "be Burthened with the Sojourning of Souldiers" against his will, a measure which was universally regarded as an unconstitutional encroachment on the liberty of the subject. This grievance had been aired as far back as 1628 in the Petition of Rights (3 Car. 1, 1): "and whereas of late great Companies of Souldiers and Mariners have been dispersed into divers Counties of the Realme, and the inhabitants against their will have been compelled to receive them into their houses, and there to suffer them to sojourne against the Laws and Customes of this Realme and to the great grievance and vexacion of the people . . . They doe therefore humblie pray your most excellent Majestie . . . that your Majestie would be pleased to remove the said Souldiers and Mariners and that your people may not be soe burthened in tyme to come." Nor was the attitude of the civilians made any more

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favourable by the frequent instances where the troops behaved badly or evaded payment for their billets. The unfortunate soldier, on the other hand, often had a legitimate cause for complaint in the miserable accommodation and vile food which he often received from the unwilling "host" on whom he found himself quartered.

It was not until 1670-71 that the billeting of soldiers on civilians was first legally authorized by a Royal Warrant, which singled out "victualling-houses, taverns and ale-houses" as the most suitable places for quartering troops. In Ireland, presumably on account of a general shortage of public-houses (*vide infra*), soldiers were often billeted on the premises of bakers, butchers and chandlers. It is easy to see why these various types of establishments, connected in one way or another with the provision of victuals, received official "patronage," so to speak, as a favourite billeting place ; it meant that the soldier would not have to go far afield in search of means of subsistence. Before long it became a well-established custom to quarter troops as a first choice in public-houses and, if these were not sufficient in number, in private dwellings.

The compulsory aspect of billeting, however, whether legalized or otherwise, remained as unpopular as ever, and in view of increasing and widespread opposition it was found necessary to pass an Act of Parliament (31 Car. 2, 1) in 1679, laying down that "noe Officer Military or Civill nor any Person whatever shall . . . presume to place quarter or billet any Souldier or Souldiers upon any subject or Inhabitant of this Realm of any Degree Quality or Profession whatever without his consent and that it shall and may be lawfull for every such Subject and Inhabitant to refuse to sojourne or quarter any Souldier or Souldiers notwithstanding any Command Order or Billeting whatever." By abolishing the principle of compulsion, this Act redeemed billeting of its most objectionable feature, but unfortunately it was largely nullified by the outbreak, a few years later, of the war against France and of the rebellion in Ireland. The movement of a large army to the sea-ports, which these events involved, brought in its train an urgent need of quarters, and resort was had once more to the practice of compulsory billeting. Eventually the latter developed to such an alarming extent and was giving rise to such a public outcry that it became imperative once more to give it legal sanction, but this time restricting it only to public-houses. This was done under the Mutiny Act (1 William and Mary, 4) of 1689: ". . . forasmuch as at this present time there is a Rebellion in Ireland and a War against France whereby there is occasion for the Marching of many Regiments, Troops and Companies in severall Parts of this Kingdome towards the Sea Coasts and otherwise Bee it further enacted. . . . That for and during the Continuance of this Act and noe longer It shall and may be Lawfull . . . to Quarter and Billet the officers and soldiers in their Majesties Service in Inns, Livery Stables, Ale-houses, Victualling Houses and all Houses selling Brandy, Strong-Waters, Syder or Metheglin by Retaile to be drunke in their Houses and noe other and in no Private Houses whatsoever . . . ." To prevent abuse, it added that ". . . the officers and Soldiers soe Quartered and Billeted . . . shall pay such reasonable Prices as shall be appointed from time to time by the Justices of the Peace . . . for

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all necessary Provisions . . . ," and reaffirmed that no officer or soldier was "to be quartered or billeted in any Private House without the consent of the Owner or Occupier."

But no amount of legislation could hope to win over the people to a measure which was by its very nature so obnoxious, and which contained the seed of so much friction and strife between "Town and Redcoat." The civilian resented it on principle, while failure by the soldier to pay for his billet became an increasingly common abuse. It was gradually becoming apparent that the only remedy to the quartering of troops on an unwilling population was the construction of sufficient permanent barracks to accommodate the Army. This solution, however, was not so simple as it looked, for the very mention of the word "barracks" at that time was, to use Fortescue's phrase, "anathema in England" : it necessarily implied the perpetuation of a strong standing army, to which the man in the street had a very deep-rooted objection indeed.

The word "barracks" was originally derived from the Spanish "barraca," meaning a hut, and the first occasion when the British Army obtained first-hand experience of "barracks" or "Spanish Quarters" was in 1659, when the garrison of Dunkirk took up accommodation in special buildings originally constructed by the Spanish troops.

Some sort of barracks, it is true, had already begun to make their appearance in the "garrison" towns of England, and one finds the word mentioned in the "English Military Dictionary" (1702) under the following entry: "Barrack, a Hut, like a little cottage, for Soldiers to lie in the Camp." Such barracks as there were, however, were purely nominal, intended only for the small "garrisons" assigned to special fortresses like the Tower of London, Portsmouth, etc. Thus by 1704 the total barrack accommodation was sufficient for no more than 5,000 men, while by 1792 barracks in forty-three different garrisons and fortresses provided accommodation for a maximum of only 21,000 troops. This total was hopelessly inadequate, for in the absence of a Police Force, and with the growing industrial discontent in the manufacturing towns, the need for small bodies of troops in several towns in order to maintain the King's peace was increasing every day.

As a matter of fact, sanction for the construction of permanent barracks was first obtained in 1697, but such construction was strictly limited to Ireland, and it is interesting to record that the sole reason behind this measure appears to have been the fact that ale-houses in Ireland were not sufficient in number (*mirabile dictu!*) to allow for the quartering of the garrison.

Meanwhile, the situation in England towards the close of the eighteenth century was that the overwhelming majority of troops were still split up in small detachments, scattered all over the country and billeted in taverns and inns. In 1792, therefore, Pitt decided to build new barracks throughout the British Isles : but he realized only too well that assent to such a far-reaching scheme would never be forthcoming from Parliament, and instead of laying the proposal before the House in the normal way, he decided to charge the cost involved against the vague item of "Extraordinaries of the Army."

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The building of permanent barracks duly began, and in 1793 the office of a Barrackmaster-General, whose express duty was to supervise the construction of suitable buildings for housing the Army, was created by Royal Warrant. Everything was set for a vast programme of barrack construction, and it must have gladdened Pitt's heart to notice that his measure appeared to receive the official blessing of *The Times* which, in its issue of 17th October, 1793, stated : "Quartering soldiers upon the inhabitants has long been a subject of complaint. Barracks, therefore, must be a popular measure, because it eases the poor and the industrious of a very great burden." Even so, the piloting of a course between the Scylla of billeting and the Charybdis of barrack construction was still precarious. *The Times* itself, although still in favour of barracks, must have had a slight twinge of conscience about the constitutional propriety of the measure, as may be gathered from the following entry in its issue of 6th December, 1793 : "The want of a general erection of barracks is severely felt by the public in the country towns on whom the troops are quartered. To have a soldier put into a man's house and to be obliged to board and lodge him, is certainly more unconstitutional than to erect a house for the reception of those troops."

It was to be expected, therefore, that the erection of barracks would not go forward unopposed, and there was more than one occasion when the inhabitants of a town actually protested against the proposal to construct barracks in their midst, and requested that they be either not built at all or at least erected on unwanted or waste land on the outskirts of the town. Slowly but surely, however, the building programme made steady progress, and by 1805 sufficient accommodation for a total of 146,000 infantry and 17,000 cavalry had been provided in about 200 barracks. Thus it came about that, within the space of a decade or so, the soldier's quarters were gradually transferred from public-houses, inns and taverns to permanent barracks.

II

It is a sad commentary on the official attitude of the day that the comfort and welfare of the British soldier had no bearing whatever on the decision to provide him with permanent barracks. The chief motive that Pitt had in mind was, as has been pointed out, the impelling need to find a solution to the chronic friction with civilians over the question of billeting.

As regards the actual siting of barracks, this was dictated originally either by a lack of available billets, as for example in sparsely populated areas, or, as in the case of industrial towns, by the need to maintain a concentration of troops ready to come to the aid of the civil power in the event of riots.

The barracks themselves were drab, dingy, depressing buildings, built in the form of a square round a central parade ground, and surrounded by a high wall. As was to be expected in an age which had not yet heard of Chadwick's "Sanitary Idea," they were badly constructed, and, of course, grossly over crowded.

Such things as scales of floor area or cubic area did not exist, and cases were by no means uncommon where barrack rooms with a floor area of 600 sq. ft. were

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intended to sleep 64 men. Little wonder that in certain instances the spacing between beds was less than six inches !

The so-called "beds" were large wooden cribs, often double-bunked, each taking four men. Single iron bedsteads did not become a general issue until well after Waterloo, as one of the several improvements introduced by the Duke of Wellington while he was Commander-in-Chief. As Fortescue rightly remarks, in fact, the Duke's epitaph might well have been, "He gave the British soldier a bed to himself."

Apart from the wooden beds, the only other item of furniture was a long wooden table running along the centre of the barrack room, where the men ate, drank—and cleaned their equipment. Very often, the foot of the beds came to within two inches of this table. No heating of any kind was provided, and windows and doors were therefore kept hermetically sealed day and night in an effort to keep warm ; as a result, ventilation was virtually non-existent. The only illumination was by a "couple of 'dips,' which only made the barrack room look darker still and by the light of which it was impossible for the men to read, or to pursue any occupation except smoking." (Florence Nightingale.)

There were no ablution rooms, dining rooms or recreation rooms. The only source of water was a pump in the open. Sanitation was of the most primitive kind, consisting of open cess-pools directly adjoining the barracks. A wooden tub was provided in each barrack room as a night urinal : after being emptied first thing in the morning, and then filled with water, it provided the only receptacle where the men could perform their ablutions !

Such was the sombre, tragic tale so tersely and forcefully summed up in Fortescue's trenchant words : "On being passed into barracks, the soldier found himself infamously housed."

III

This state of affairs continued, with slight changes, right through the first half of the nineteenth century.

Thus, a return prepared by the Barrack Department in 1848 revealed that, out of 343 barracks in the United Kingdom, not more than 59 allowed for a minimum of 450-500 cubic feet per man. The majority allowed for 400-450 cubic feet, while for the rest of the country the figures, as Professor W. A. Guy remarked when commenting on this return in 1858, were ". . . still more disreputable. At Chatham and Upnor the Infantry were put upon the miserably short allowance of 220 cubic feet of air per man . . . , the Cavalry at Maidstone were doomed to 174 cubic feet, and the soldiers in Dover Castle must have been rotting, like sheep in the marshes, in a filthy atmosphere, measured out at the starvation rate of 147 cubic feet per man." These figures may be compared with the allowance prevailing at the time in work-houses (480 cubic feet per bed) or in St. Giles model lodging-house (542 cubic feet) !

In 1855 a Government Committee was appointed to examine the layout of existing barracks and to recommend necessary improvements. As a result, new

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barracks constructed from then onwards afforded accommodation of an improved pattern, but no steps were taken to bring the older type of barracks up to the new standards.

It was not until the ghastly horrors of the Crimea were brought to light that an indignant nation eventually became aware of the miserable conditions which the long-suffering British soldier had been obliged to endure both in peace time and during war. From then on there was an insistent clamour for an improvement in the soldier's environment, and the government of the day had no choice but to bow to informed opinion and carry out the necessary reforms.

In 1857 a Royal Commission was appointed to inquire, among other matters, into the "Regulations affecting the Sanitary Condition of the Army." Its members included the Right Hon. Sidney Herbert (afterwards Lord Herbert of Lea), Dr. Andrew Smith, the Director-General of the Army Medical Department, and Dr. Sutherland, who had been a member of the Board of Health. Their report, laid before Parliament in 1858, contained a glaring account of the appalling conditions prevailing in army barracks at that time, and of their bad effect on the health of the unfortunate troops who were obliged to live in them.

It was shown, for example, that, largely as a result of overcrowding and insufficient ventilation, "while in civil life at the soldiers' ages, the deaths by pulmonary diseases are 6.3 per 1,000, they amount in the cavalry to 7.3 ; in the infantry of the line to 10.2 ; in the Guards to 13.8 per 1,000. . . ." Nor did this represent the true picture, for, as the Commissioners pertinently pointed out, a large number of soldiers were being continually invalided out on account of pulmonary disease, so that when they eventually died of the disease they helped to swell the civilian mortality figures and to diminish those of the army in proportion.

The Commissioners had some scathing comments to make on the deplorable state of affairs which their investigations brought to light. On the question of accommodation they stated that "it ought not to be possible to say . . . that a soldier never knows a healthy home, as regards air and space, till he commits some crime which brings him into the thoroughly ventilated cell of a military prison," and that "paupers are better lodged than our soldiers."

The following recommendations regarding barracks were submitted by the Committee :

(1) A minimum cubic capacity of 600 cu. ft. per man.

(2) A minimum interval between beds of 3 ft.

(3) Provision of adequate ventilation.

(4) Replacement of urine tubs by external urinals on the water carriage system, or by chamber pots.

(5) Abolition of cess-pools, and the installation of proper drainage.

(6) Provision of an abundant water supply.

(7) Installation of artificial heating.

(8) Introduction of gas as a means of artificial lighting.

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(9) Provision of separate ablution rooms, baths, dayrooms, laundry, drying rooms and workshops.

(10) Provision of kitchen equipment for baking, frying, etc.

(11) Construction of married quarters.

(12) Medical opinion, as regards both siting and planning, to be obtained before the construction of any new barracks.

These far-reaching proposals, incorporating the very latest principles of hygiene and sanitation then in vogue, were accepted, and, largely at the instigation of Florence Nightingale, a "Barrack and Hospital Improvement Commission" was appointed, charged with the duty of supervising the implementation of all the necessary improvements and alterations. The Commissioners inspected existing barracks throughout the British Isles, and prepared a series of interim reports, followed by a final "General Report" which was laid before Parliament in 1861.

At this stage it would not be altogether out of place to say a word about the influence of Florence Nightingale on the improvement of military barracks, for her name is, indeed, writ large on the health charter which nowadays covers all aspects of the soldier's accommodation. Her own ideas on the subject had crystallized as far back as 1857. In her will, prepared towards the end of that year, she directed that some of her effects should be utilized towards the construction of a model barracks which was to incorporate "day-rooms for the men, separate places to sleep in . . . lavatories, gymnastic places, reading-rooms, etc. . . . not forgetting the wives, but having a kind of Model Lodging House for the married men." One cannot help wondering, in view of these enlightened ideas and of Florence Nightingale's close collaboration with Sidney Herbert, how many of the recommendations of the 1857 Royal Commission were directly or indirectly due to her. But this was not all. Mention has already been made of the part she played in the appointment of the Barrack and Hospital Improvement Commission. The interim reports of this Commission, as well as their plans for new barrack construction, were submitted for her criticism and advice, while their General Report, especially where it deals with the principles of barrack construction, was largely her work. Again, it was due to pressure on her part that a special Barrack Works Committee was appointed in 1861 "to report as to measures to simplify and improve the system under which all works and buildings other than fortifications, are constructed, repaired and maintained, in order to give a more direct responsibility to the persons employed in those duties." Finally, it was through Florence Nightingale's insistence that the Improvement Commission, renamed the Army Sanitary Committee in 1862, was eventually made into a permanent body, directly responsible to the Secretary of State.

It was indeed fortunate for the British Army that Sidney Herbert became such an enthusiastic follower and disciple of Florence Nightingale, for in his capacity as Secretary of State for War he succeeded in inducing the Treasury—notoriously niggardly by tradition where the Army is concerned—to release sufficient funds for carrying out improvements which changed the accommoda-

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tion of the private soldier beyond all recognition. This is how Florence Nightingale herself summed up these improvements in 1862: "These establishments have . . . been provided with combined ventilation and warming. . . . Drainage has been introduced. . . . Water supply has been extended, baths introduced . . . and the lavatory arrangements generally improved. The . . . kitchens have been completely remodelled; the wasteful cooking apparatus only fit for boiling, has been replaced by . . . cooking ranges for roasting etc. . . . Gas has been introduced . . . instead of . . . 'dips' . . . Many important structural alterations for increasing window light, circulating fresh air . . ., ventilating stables, abolishing ash-pits, etc., have been carried out."

Admittedly, it was going to take time before all these dramatic changes were to become an accomplished fact in every single barracks throughout the land, and it could well be that, as time went on, the new standards would require further modification or improvement. But if the end of the road had yet to be reached, it was at least in sight. The authorities had at last realized that the proper siting and construction of barracks were something more than the mere provision of a roof over the soldier's head, that they had a direct bearing on his health, and that the subject was of sufficient importance to justify the creation of a controlling and supervisory *ad hoc* body in the shape of the Army Sanitary Committee.

From now on, the Army Medical Department would include among its duties the keeping of a careful watch over the hygiene aspect of the soldier's permanent home. Circumstances would no doubt arise, chiefly in the matter of finance, which, lying entirely outside the Department's control, would hamper the speed or extent of barrack improvement or construction. But the two essential principles, that suitable accommodation is indispensable to the health of the Army, and that medical advice must be obtained and followed at all stages of barrack planning and construction, were now officially recognized.

No longer would British barracks be synonymous with urine tubs and with close, foul air, two evils which Farr referred to in 1861 as "the idols which had been heretofore worshipped . . . and which have . . . destroyed more men in the British Army than either the glittering steel, or the flashing artillery of its foes."

Gone for ever were the days when joining the Colours meant, to echo Florence Nightingale's poignant phrase, to "enlist to death in the barracks."

It was the dawn of a new era in the history of the British Army.

IV

The last thirty years of the nineteenth century saw a vast expansion in the programme of barrack construction. The Military Forces Localization Act of 1872, the Barracks Act of 1890, and the Military Works Acts of 1897, 1899 and 1901, authorized the building of new barracks or the further improvement of existing ones. In every case, designs for the new buildings embodied progressive ideas which, subject only to the usual limitations of finance, were based on the latest school of thought.

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War Office responsibility for barrack construction is shared between various departments. The Quartermaster-General's Branch is responsible for planning, and is the final authority for all details of accommodation standards, which are worked out by the Barrack Synopsis Committee. The Directorate of Fortifications and Works is responsible for the preparation of designs, and for actual construction. The Directorate of Army Health gives expert advice on designs and on standards of accommodation.

Barracks are built according to a standard specification contained in "Barrack Synopsis," a War Office publication, the first edition of which appeared in 1865, and which gives "statements of particulars based upon decisions which have, from time to time, been laid down by authority, as regards the military buildings authorized for various units, and the accommodation and fittings to be provided in connection therewith." The Synopsis includes such data as the minimum floor area per man, the minimum height of rooms and the type and number of the various fixtures.

The actual design of barracks is based on a series of "Standard Plans" which are prepared at the War Office for all types of buildings ; for example, barrack blocks, dining rooms, kitchens, etc. They are intended to avoid the need of preparing a brand new design every time that an army building has to be constructed.

Over-all medical supervision of general policy in connection with barracks is one of the duties of the Army Health Advisory Committee which, under the title of Army Hygiene Advisory Committee, came into being in 1919 as part of the Directorate of Hygiene at the War Office (now Directorate of Army Health) and replaced all former hygiene committees.

Both the Barrack Synopsis and the Standard Plans are kept continually under review, and amended or reviewed to keep them in line with current ideas. The design of barracks is, in effect, undergoing a constant evolution.

Conclusion

This short survey has traced the evolution of British Army barracks from earliest times.

And what of the future ? Let the latest (1948) edition of "Barrack Synopsis" itself provide the answer in the following extract, which gives the existing scale of accommodation for a Barrack Block intended for the Male Rank and File.

Barrack Block (Male Rank and File)

1. Barrack blocks will normally be built in two storeys, though single storeys may be required.

2. Each floor will be self-contained, and will comprise bedrooms, toilet area, drying rooms, cleaning room and linen store (*see note* (*a*)). Each block will contain a sitting room and fuel store.

3. Bedrooms on each floor will be designed in the ratio of two 4-men rooms to three 8-men rooms. Individual bedrooms will be provided for corporals.

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Room etc.	Normal Area sq. ft.	Normal Height ft. in.	Special Fittings No.	Special Fittings Detail
Main entrance	—	—	1	Notice board.
				Cupboards for cleaning utensils—one on each floor.
			2	Long mirrors (5 ft. × 1½ ft.), one at each entrance.
Bedrooms	70 per man	8 6	—	Fixed shelves over each bed; built-in bedside lamp.
Bedrooms (corporal) ...	75	8 6	—	Fixed shelf over bed; built-in bedside lamp.
Sitting room	3 per R. & F., minimum 150	8 6	1	Amenity fireplace.
Toilet area—				
Ablution room ...	—	—	25 per cent.	Washbasins (h. and c.). Fixed mirrors running full length of washbasins.
			4 per cent.	Washing sinks (h. and c.) (minimum one per toilet area).
			1	Drinking fountain (per toilet area).
Bathrooms	—	—	5 per cent.	Slipper baths (h. and c.) (minimum one per toilet area).
			10 per cent.	Shower baths (h. and c.) (*b*).
Lavatories	—	—	12½ per cent.	W.Cs.
			6 per cent.	Urinals (single).
Cleaning rooms	80 plus 2 per R. & F.	8 6	1	Bench, part slate, with raised edge.
			1	Electric iron.
			1	Sink (h. and c.).
Linen store (*a*)	—	8 6	—	Racking.
Drying room	1 per R. & F.	8 6	—	Racking and hooks.
Fuel store	—	—	—	—
Calorifier room (if required)	—	—	—	—

(*a*) A separate linen store will only be provided when the main Q.M. stores is not adjacent to the barrack block.

(*b*) This scale will be increased to 15 per cent. in sub-tropical and tropical climates.

A far cry, indeed, from the "infamous house" which was the soldier's lot barely a century ago.

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AN INSTANCE OF THE GANSER SYNDROME

BY

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THE patient, M., aged 29, was referred to the Royal Victoria Hospital, Netley, for a psychiatric opinion on his fitness to undergo trial by court-martial on a charge of desertion. He had been absent without leave for seven months. From the patient himself, his parents, and army documents, the following history was constructed.

He was born after a normal pregnancy, and his childhood and school years passed without obviously unusual features, though he was not very bright at his lessons and did not play games. He has a younger brother aged 22 and a sister aged 25. His parents are both alive and in good health.

After a few semi-skilled jobs, he joined the Regular Army as a private in 1941. He had a clean record until his recent absence. On enlistment he was S.G. 3.

He married "in haste" nine years ago. There is one child, a boy of nine. He adored his wife at first, but their relationship soon deteriorated, largely, it appears, through his own bad temper and petty jealousy. While he was abroad from 1943 to 1945 his wife had a child by another man, and he obtained a divorce on the grounds of adultery in November, 1950. His wife retained the custody of their child.

In July, 1950, he was involved in a road accident and was in hospital for

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several months with severe chest injuries and lacerations. Most of the time in hospital he lay crying or saying nothing. At the time of his divorce he seemed to his parents "a different man."

He wandered in and out of the house with no explanation, absolutely refused to discuss his wife, and was tearful and depressed. He went absent without leave at Chester on 8th July, 1951. He spent seven months wandering around fair grounds doing odd jobs. From time to time he would arrive home, stay a few days, and borrow some money from his parents. He seemed to them to be in a daze and "not himself." He hardly talked to them ; he complained of headaches and had developed a marked stammer. He surrendered himself on impulse at Lichfield on 8th January, 1952. He was awaiting court-martial when he was referred to the Area Psychiatrist at Chester on 25th February, 1952, on account of his mental condition. On examination at Chester he was in tears during most of the interview, and was almost unable to communicate anything because of a marked speech impediment, but he told of his divorce and driving accident. He said he desired to kill himself. He was admitted to Netley on 27th February, 1952.

Progress

On admission he was completely mute. He would blow out his cheeks and become blue in the face in prodigious efforts to utter even a whisper. He would then cry, beat his head and tear his hair. He would communicate freely in writing and could understand what was said to him. Under pentothal narcosis he spoke fluently and released a torrent of obscene abuse against his wife and the army. He yelled himself hoarse in a few minutes, and then burst out weeping, crying "Mom, me Mom's good, me Mom's good, she's good, yes she's good." He then enacted his driving accident, crying out, "It's not my fault, not my fault." (There was no fatality in this accident.) After the session he again became mute.

In five subsequent sessions during the next three weeks he behaved in the same way. After the third session he talked with difficulty for a while and felt that he was going blind. After the fifth session he talked fluently, but felt weak and faint. He complained of dizziness and a splitting headache. By the following day these symptoms had disappeared, but he seemed to be in a confused state of anxious excitement.

Under fairly heavy sedation his anxiety became less evident, and now he behaved like a little child. He had to be fed and assisted to his toilet. He wanted to play with some toys, in particular a yo-yo. It was impossible to elicit a correct answer to the most simple questions. He said that two times two were two. He called an apple an orange. He said that leaves appear on the trees in autumn, and gave the date, month and year incorrectly ; he said that he had been in hospital for months and that he was now in Chester ; his mug, he said, was "for drinking," but as for its name, "I don't need to know that." Asked who was the Prime Minister, he said that it used to be Mr. Attlee but did not know who the present one was. If pressed to give the correct answer he would cry or laugh, or fly into a rage, or say, "I've nothing to do with that, I'm only thinking of me Mom."

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Any mention of his wife, the army, or the outside world in any aspect was met by either vicious ridicule or by rage, when he would growl, gnash his teeth, spit, and shout obscenities. He was never actually violent. He would talk of nothing except his "Mom and Dad." He would say, "I'm going to think of me Mom all my life—even if I live for a thousand years ; that's all I want, me Mom. Me Mom's good, she's here, she's in this hospital, she's in the N.A.A.F.I. I was speaking to her this morning, etc."

People were either entirely good or entirely bad (e.g., his mother and wife). He sometimes called the nursing officer "Mom." His whole body was analgesic and his hands had to be bandaged because of his practice of stubbing out cigarettes on the back of his hand. He would fall into a deeply suggestible state at a mere word, but it was not possible to elicit a correct answer even under hypnosis.

He gradually improved until after six weeks his parents could not recognize any difference in him from his old self.

Discussion

The features of the syndrome described briefly by Ganser (1897) are :

(i) "A specific hysterical twilight state, the chief symptom of which is talking past the point" (*Vorbeireden*). Hence it has been called the "syndrome of approximate answers."

(ii) He noted this syndrome in prisoners on remand.

(iii) All his cases were hallucinated.

(iv) Many exhibited generalized analgesia.

(v) The condition always subsided in a few days.

The syndrome is usually described among prison psychoses and it is generally thought to be uncommon outside prison, though this has been disputed (Lieberman, 1945). The condition is described by Henderson and Gillespie (1940), who associate it with hysterical "pseudo-dementia" (Wernicke) and hysterical puerilism. They quote Bleuler as saying "What is characteristic is the disappearance of the memory for elementary knowledge and experience, which remains intact in the organic disturbances."

Various suggestions have been put forward in an attempt to understand the meaning of this peculiar reaction in dynamic terms. Stern and Whiles (1942) consider it occurs when the patient, "although mentally deranged, not realizing this, wishes to appear so." Anderson and Mallinson (1941) think that many Ganser states may be schizoid reaction psychoses. Noyes (1948) says that "the patient, being under charges from which he would be exonerated were he irresponsible, begins, without being aware of the fact, to appear irresponsible." Lieberman (1945) suggests that it is a "psycho-physiological regression to the unconscious level, available to all patients entering upon mental illness, and utilized as a drastic attempt at self-reorganization."

There is a general trend in the articles quoted above to emphasize the existence of an intolerable external situation from which the individual strongly

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desires to escape. However, every author is agreed that the paralogia of the Ganser syndrome is not entirely consciously determined.

Our patient appeared both to resent and to fear being questioned. He evaded responsibility by his paralogia, which was also a token of the attitude he adopted, when he was not crying or raging, of contemptuous indifference to the questions which he was asked. The precipitating factor was the removal of the hysterical speech inhibition. The patient tried to restrict the range of the thinkable to one subject alone—the Good Mother ("I shall think of me Mom alone for a thousand years and nothing else"). He regressed to the age of two or three, he incorporated orally his Good Mother and projected his psychic reality to the external world ("Me Mom's here, she's in the N.A.A.F.I.," etc.).

The paralogia, the regression, the confused, disoriented consciousness, the wholesale denial of unpleasant external reality, the hallucinosis, the generalized analgesia, together seem to constitute a peculiar constellation of ego-defences which, in this particular combination, are not perhaps constitutionally available to every hysteric.

It would seem that this Ganser-like reaction may be understood as a massive, desperate, and temporary defence to a situation fraught with both internal and external danger to the ego. In this case the most intense and immediate danger was intra-psychic.

Summary

A case of the Ganser syndrome is described and briefly discussed in the light of some of the theories relating to it.

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A SURVEY OF SERVICE PSYCHIATRY IN THE FAR EAST DURING 1951

BY

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In a letter written by a National Service Medical Officer and circulated by our Director-General, it was stated that the scope of Medicine in the Army was very limited, except perhaps in the field of Bacteriology, Pathology and Public Health.

We venture to suggest that psychiatry in the Army, especially in an overseas theatre, offers very much more scope and variety of clinical material than the average psychiatric civilian practice in the United Kingdom. This article is being written in an attempt to give doctors, both service and civilian, an idea of this type of psychiatric work. The clinical aspect of psychiatry is described, rather than the prophylactic psychiatric measures which, although we may appear to ignore them, we regard as important and necessary features of our work, in maintaining an adequate standard of mental hygiene.

We find it convenient to divide the article into three sections. The first deals briefly with the psychiatric administrative set-up in this theatre, and some statistical tabulations are given showing a breakdown of the cases seen in their respective categories—i.e., British Army personnel, other services, local troops, families, etc. A further break-down of these categories into the different diagnoses is made. The second section deals with all service personnel, and as we are a British Army unit, British soldiers are dealt with in greater detail. The third section is devoted exclusively to families. This large group, with such obvious differences from the bulk of service personnel in both ætiological considerations and psychotherapeutic requirements, deserves separate analysis.

Section I

The psychiatric set-up in this theatre consists of three psychiatrists, the senior of whom acts as consultant. His duties, in addition to those of an adviser to the Director of Medical Services in all matters pertaining to mental health, include those of visiting psychiatrist to various hospitals throughout the command. Out-patient clinics are held at these hospitals and admission of those patients requiring special treatment arranged. The second psychiatrist is in

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charge of a psychiatric block in a base hospital. This block contains open wards and closed side-rooms, where all forms of psychoses and psychoneuroses are admitted and treated. In addition to the two psychiatrists in attendance, the staff consists of one Q.A.R.A.N.C. Sister, who has psychiatric training, and eleven British other-rank orderlies, more than half of whom have Army Mental Nursing Orderly qualifications. All modern forms of psychiatric therapy are carried out here, as will be detailed more fully later in this article, but it must be pointed out now that this is the only service hospital in the theatre where such therapeutic facilities are available and cases arrive by air, road, sea and rail almost daily. The third psychiatrist has a small psychiatric ward and out-patient clinics, in an isolated area, not easily reached from this base. His work and cases are not referred to in this article, other than cases he has sent to the psychiatric block for special treatment which he is not able to do with his restricted staff and equipment.

During the year 1951, a total of 861 patients attended the Psychiatric Centre, 537 as out-patients, and 324 as in-patients, (Table I).

TABLE I.—ALL IN-PATIENTS AND OUT-PATIENTS

British Army personnel	477
Families (including children)	102
Local troops	110
Royal Navy, R.A.F. and civilians	172
	861

Table II shows the breakdown of this total by types of disease, and we have simplified the groupings by listing all the psychoses under one heading, whether they be schizophrenics, manic depressives, etc., and all the psychoneuroses under one heading, whether hysterics, anxiety neurotics, obsessional states, psychopathic personalities, etc.

TABLE II.—ALL IN-PATIENTS AND OUT-PATIENTS

Category	Psycho-neuroses and Psychopathic Personality	Psychosis	No Gross Psychiatric Disability	Other Diagnoses	Total
British Army personnel	230	23	221	3	477
Families	87	6	5	4	102
Local troops	38	16	54	2	110
Royal Navy, R.A.F. and civilians	69	11	89	3	172
Total	424	56	369	12	861

Table II shows the apparently high figure of 369 patients who were found to have no gross psychiatric disability, but it must be pointed out that the majority of these patients were not referred unnecessarily and the diagnosis made did not imply that there was absolutely nothing medically wrong. Such a high incidence of patients with a "No gross psychiatric disability" diagnostic label is essential in service psychiatry. The vast majority of such cases are not malingerers or column-

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dodgers, but soldiers with minor forms of psychiatric disability where maybe a single session of psychotherapy with explanations, persuasion and re-assurance is alone necessary. These soldiers go back to their units, to full combatant duty, and experience has shown that it is wise not to award a diagnosis of mild neurosis in these cases. A psychiatric label once applied has the habit of sticking to the soldier for the rest of his service.

Section II

Although this section deals with all three Services, we have dealt more fully with British Army personnel, and the soldier has been more in our minds, in writing this section, than the sailor and the airman.

The main ætiological factors at play in the production of psychiatric breakdown in the service personnel in this theatre may be divided conveniently into two broad categories—(*a*) constitutional factors and (*b*) environmental factors.

Prominent among the constitutional factors are such features as heavy psychiatric loading due to a bad familial history. Particularly in the psychotic group we came across cases where there is a history of insanity in one or both parents, and the soldiers themselves may have shown signs of instability in childhood or adolescence. We have come across soldiers who have actually spent periods in Mental Hospitals in their pre-service history, or have received mental specialist treatment in their own homes. We have even met re-enlisted men who were invalided from the Services on psychiatric grounds during the war and who rejoined because they were unable to make the grade in civilian life. Cases with such heavy psychiatric loading are no doubt becoming rarer nowadays, due to the effective screening at Army Basic Training Units, but the odd case will always slip through no matter how efficient the screening may be.

Among environmental factors there is a diversity of features, one or more of which are seen to act as a precipitant in mental breakdown.

The following commonly recurring factors are: (*a*) separation from home; (*b*) domestic disharmony or worry over wife, family or financial matters; (*c*) dislike of the Army, regret at having signed on for a regular engagement, discontent at present employment, or disappointment over lack of promotion; (*d*) poor adjustment in the Army—for example, a soldier belonging to an older age group posted to a unit consisting mainly of young National Service men, some of whom may be senior to him in rank; (*e*) marriage just before embarking on an overseas tour—quite a common occurrence; (*f*) poor education or intellectual dullness with employment beyond mental capacity; (*g*) anti-social and anti-Army bias, due to faulty early life environment—for example, the institution child or the soldier with a previous history of psychopathy, with perhaps a probation, approved school, Borstal or even civilian prison record; (*h*) postponement of Army release due to the emergency; (*i*) traumatic battle experience; (*j*) boredom because of inactivity in a base installation; (*k*) dislike of the tropics, the people or the climate; (*l*) previous P.O.W. experiences.

So much for the main precipitants of mental breakdown in British Service men in this theatre.

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A point of interest with perhaps a relevant bearing on army morale is the abnormally large number of psychiatric referrals from Regular soldiers as compared with National Service men. Of the 477 British Army personnel seen at the psychiatric block during the year, no fewer than 433 (92 per cent.) were Regular soldiers. This striking contrast may perhaps lose some of its significance when the numerical preponderance of Regular over National Service soldiers in this part of the world is considered, but we believe that the inference can still be drawn from these contrasting figures that, in general, the National Service soldier has a higher standard of mental health than his Regular comrade. It is not difficult to find reasons for this. Hardly any of the constitutional factors at play in symptom production apply to the young National Service man. Personnel selection and psychiatric screening at intake usually ensure that the preneurotic, potentially psychotic and mentally backward recruits are quickly detected, and either rejected from service altogether or allocated to restricted employment well within their mental capacity. Again, few of the environmental precipitants of psychiatric breakdown apply in the case of the National Service man. He is, naturally, of a younger age group, and, being young, has an adventurous spirit, is seeing the great wide world for the first time, and the glamour of the tropics is still sufficiently novel to prevent him from becoming disgruntled and bored, unlike his Regular Service comrade, the hardened old campaigner who has seen it all before. The National Service man, furthermore, is usually a single man, and consequently has a minimum of domestic, financial or accommodation worries. He is a young boy, many thousands of miles away from home, it is true, but his separation-anxiety has usually resolved itself during his basic training, long before he embarks on overseas duty, and in any case his tour of duty overseas is so short, usually just over one year, that it lies well within his capacity to abide the time of his home coming, without resorting to symptoms of neurosis.

The Regular soldier, of course, being usually older, is more likely to be married. Because of the exigencies of the Service, it may be necessary for him to be separated from his wife and family for an indefinite period, perhaps for three years. If his wife remains in the United Kingdom, he frequently gets disturbing letters from home, where his wife, due to the prevailing financial stringency and austerity, may be finding it difficult to cope. Before the war the Regular soldier was prepared to take the rough with the smooth, and knew that he might be separated from home for long periods on campaign duties—he was prepared for this, and accepted it as part of a soldier's life. Today, when he sees his National Service comrade going home after a short tour, in the highest possible state of morale, it is not surprising perhaps that he finds it difficult at times to adjust himself happily to his army career. If there is any underlying instability in his personality, he is likely to become a psychiatric casualty—and this type of psychiatric disability is one not at all easy to cure. However, much can be done to help him, with the aid of Red Cross, Welfare and S.S.A.F.A. organizations, and occasionally leave or Home postings on compassionate grounds. Invaliding to the United Kingdom in this type of case is only resorted to when the psychiatric breakdown is really severe. A common-sense approach is necessary, for

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if every soldier with home worries was sent home on medical or compassionate grounds, we would soon find ourselves out here without an army at all.

Another interesting feature encountered during the year with almost monotonous frequency was the number of patients referred for assessment with some form of suicidal tag attached to the case histories. Eight per cent. of all cases seen, 70 patients out of the over-all total of 861, were referred with a suicidal tag, whether genuine or hysterical, pseudo-suicidal attempts or merely suicidal gestures or ideas. We feel that this percentage is abnormally high, in an essentially healthy young adult population, and as these cases are time-consuming and require a considerable degree of experience and responsibility in making correct diagnosis and disposal, a more detailed analysis may be of interest.

These cases invariably give cause for a certain amount of anxiety, and rightly so, for when a patient under psychiatric treatment actually commits suicide, the layman's attitude of awarding a black mark to the unfortunate therapist is sometimes quite unjust. Some people can commit suicide—the cultural racial practices of the ancient Romans or the modern Japanese are examples, if examples are needed, and it sometimes happens that the half-hearted pseudo-suicidal hysterical attempt is more successful than the unfortunate victim intended. But the psychiatrist is not a fortune teller or a seer ; he may predict but he cannot foretell the future with certainty. He can only assess the mental state of the possible suicidal patient and act on this assessment. Only 8 of the 70 suicidal patients were in fact diagnosed as psychotics, and few were placed on Special Suicidal Precaution Cards, apart from an initial period of 24 to 48 hours' observation which is always advisable before making a firm diagnosis in these cases. Forty out of the total of 70 were found to have no gross psychiatric disability. They were usually psychopathic types who required firm handling ; they were invariably returned to the unit guard room with a minimum of delay, and at the same time disciplinary action was recommended.

One National Service man held the record for hospital admissions because of pseudo-suicidal attempts. On one occasion he took an overdose of aspirin tablets, and on two occasions he slashed his arms and wrists with a razor blade. No psychiatric disorder was discovered and he was awarded 18 months' detention at a subsequent court-martial, where he was charged with self-inflicted injuries, rendering himself unfit for duty. Twenty-two of these suicidal patients were found to be suffering from acute anxiety, reactive (non-psychotic) depression, hysteria or just puerile immaturity. Although the majority made sufficient recovery to return to duty, perhaps in a lower medical category and in restricted employment where they could periodically attend conveniently for out-patient psychotherapy, a few required invaliding home.

Out of the 70 suicidal patients, 26 made suicidal or pseudo-suicidal attempts of one sort or another. Attempting to hang themselves headed the list with a total of 8 cases—some were genuine enough, others showed that the patient went to some pains to attract attention before starting the attempt. This was closely followed by body, arm or wrist slashing with knife or razor blade (7 cases). Most of these were obviously hysterical in nature ; the incisions were usually

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multiple but superficial, and the patient was often the inmate of a guard room or detention cell. Swallowing some noxious substance came next (4 cases), followed by attempted drowning (3 cases), jumping from balcony (2 cases), hunger strike (1 case) and cut throat (1 case).

The single case of cut throat was of interest, in that it was deliberate and genuine, and was probably not successful in the end through lack of courage. The injuries were quite severe. The patient was a warrant officer with a very good army record, who had just been recommended for a commission. His depression was of a reactive nature, and as his difficulties were fairly easily sorted out he made a rapid recovery.

In spite of this mixed bag of suicidal patients—i.e., psychotics, neurotics, psychopaths, and the wide variation of disposal (invaliding, out-patient therapy, court-martial), none of the 70 suicidal patients encountered during the year was successful in his suicidal efforts.

An interesting sideline to service psychiatry is the amount of medico-legal work encountered. Out of the total of 477 army personnel, 67 were medico-legal cases. Forty-one were referred before trial, and a report in the form of a disciplinary *pro forma* was submitted after due examination. This *pro forma* report embodies the McNaghton rules, and from it the Convening Officer of a court-martial is able to see whether, on medical grounds, the accused soldier is adjudged sane or insane, fit or unfit to plead, knows or does not know the difference between right and wrong, and whether, if he does know the difference, he knows that in committing the offence he is doing wrong. In this *pro forma*, which has been designed to obviate the necessity for medical men to appear personally in court in every disciplinary case, the psychiatrist is asked to express an opinion on legal as well as medical insanity.

Of the 41 cases seen before trial, only one was considered unfit to plead, and he was ultimately invalided to the United Kingdom, without trial, suffering from an acute psychosis. Five cases required admission to hospital, for a further period of observation, before a firm diagnosis could be established, but these cases were all subsequently discharged to units to await trial.

The remaining 26 medico-legal cases were soldiers under sentence, and of these, three soldiers were found unfit on psychiatric grounds to continue sentence, and they were invalided home after medical board action.

Occasionally one encounters the psychopathic soldier under sentence who decides he has done enough punishment, and is determined to become a nuisance. He refuses food, smashes up his prison cell, becomes aggressive, violent and almost unmanageable. These cases may require admission to hospital for a period of observation, but they are usually feigning insanity and are fairly easily found out.

Not only is there a wide range of clinical material in service psychiatry, but in this theatre particularly there is plenty of variety as far as the cultural *milieu*, racial origins and language differences of our patients are concerned. There have been times when a stranger, walking through the wards of the psychiatric block, might have thought, and with good reasons, that he was visiting a miniature

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Tower of Babel. During the year we have had to deal with psychotic Turks, Greeks, Danes, Dutch, French, Indians, Gurkhas, Malayans, and one wild man from Borneo, who, luckily for us all, was not in any head-hunting mood during his sojourn here. Language differences present a great problem, and even with a good interpreter—an unusual event—it is difficult to get across even basic psychotherapy in psychoneurotic cases.

We have already referred briefly to the forms of treatment carried out in the psychiatric block at the base hospital. Some facts and figures may perhaps give a picture of the scope of the work here.

During 1951, 122 sessions of electroplexy were given, mainly for catatonic and other unmanageable schizophrenics, but this form of therapy was also employed for reactive and endogenous depressions and the occasional case of hysteria. The diphasic type of shock using a McPhail and Strauss machine was found to give more valuable results than the monophasic, and this type of electroplexy is now solely employed.

Fifteen patients were treated with modified insulin therapy, and courses of between three and four weeks were usually sufficient and effective. Mild neurotic breakdown in a soldier with a good premorbid personality responded well to this form of therapy, and excellent results were also obtained in two cases suffering from post-traumatic mental deterioration. The carefully selected patients who were given modified insulin were ultimately all returned to full duty, and follow-up reports showed that improvement was fully maintained. There has been no relapse so far. Deep insulin shock therapy was rarely employed and never carried to completion, as patients requiring this treatment, being long-term, were medically boarded and, if European, evacuated to the United Kingdom without delay, or if local soldiers, transferred to their local mental hospitals.

Continuous narcosis and lesser variations ranging from heavy and deep to mild sedation were actively employed in selected cases. Results were at times quite striking, especially with soldiers with a good service record who had cracked up suddenly with symptoms of acute anxiety. The salvage rate in this group was quite high, and the majority were ultimately able to go back to full duty, without reduction in medical category. We usually limited the drugs employed on continuous narcosis and other forms of sedation to three basic types—(*a*) barbiturates, usually sodium amytal and phenobarbitone, (*b*) chloral hydrate, and (*c*) paraldehyde. We found 10 c.c. of pure paraldehyde given intramascularly of real value in dealing with violent and maniacal patients. We encountered no local complications using paraldehyde in this way, and we have employed this method in emergency for some years now. We have, of course, long since removed such relics of the past as rubber rooms and strait-jackets from our equipment. We found it a valuable procedure, in cases of acute psychiatric emergency where force and immediate sedation were necessary, and intravenous pentothal was not possible, to administer an ordinary rag-and-bottle ether light anæsthetic, as a preliminary to intramuscular paraldehyde.

Various abreactive techniques, using sodium pentothal, ether and carbon dioxide, were employed during the year. Altogether 128 sessions of narco-

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analysis, using pentothal, were employed. This method of treatment was, of course, of especial value in dealing with neuroses associated with traumatic battle experiences, and dramatic results were sometimes obtained. Good results were also obtained by the use of intramuscular vitamin B therapy, especially with nicotinic acid and thiamin. Two examples of Korsakow's syndrome showed excellent improvement of their mental symptoms with intensive vitamin B therapy. Methedrine, myanesin, thyroid, dexedrine and epanutin were other therapeutic agents employed in selected cases. Methedrine, however, on the whole, was disappointing, and we felt it could not be considered an alternative to E.C.T., as we had hoped. Myanesin, given by mouth, in the form of an elixir (Elixir Myanesin B.D.H.) in cases where the somatic features of anxiety were prominent, occasionally worked like a charm, especially when combined with strong suggestion and psychotherapy. Basic superficial psychotherapy remained the sheet anchor in the therapeutic approach to psychoneurotic patients, especially at the many out-patient interviews, and for in-patients it was combined with energetic occupational therapy and sessions of group therapy.

The results of treatment may perhaps best be studied by a short analysis of the final disposal of the 477 British Army male personnel seen during the year. These figures are chosen, as, being army, they can be accurately and conveniently estimated from our quarterly returns.

(*a*) 351 (75 per cent.) were returned to full duty. These consisted of cases which had recovered from neurotic disability after treatment, or cases where no gross psychiatric disability, or only minor forms of neurosis, existed.

(*b*) 57 (12 per cent.) were down-graded to a lower medical category (M2, S3) and returned to units with a recommendation for re-allocation to new employment in a non-front-line installation. These cases were ultimately seen by a Personnel Selection Officer who, taking into account their educational and intellectual endowments, arranged their transfer to new employment within their capacity.

(*c*) 21 (4 per cent.) were down-graded in medical category (M2, S3) but returned to units without P.S.O. recommendation.

(*d*) 45 (9 per cent.) required medical board action and invaliding to the United Kingdom. This total was made up of 23 psychotics (mainly schizophrenics) and 22 psychoneurotics (mainly grossly unstable soldiers with suggestive prepsychotic traits in their personality profile).

(*e*) Three soldiers were recommended for discharge on non-medical grounds as psychopathic delinquents.

(*To be continued*)

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A CASE OF DYSTROPHIA MYOTONICA

BY

Colonel J. T. ROBINSON, M.D., D.P.M., D.T.M. & H.

Late Royal Army Medical Corps

THIS hereditary disorder, characterized by muscular dystrophy, myotonia and other dystrophic disturbances, especially cataract and gonadal atrophy, was first described by Deleage (1890). There is usually a history of cataract in members of preceding generations of the same family.

The incidence of the disease throughout the world is difficult to assess from the literature available. Waring *et al.* (1940) point out that the condition is more common than is generally believed and frequently unrecognized clinically. Their view is supported by Caughey and Brown (1950).

It is certainly a condition rarely found in the British Army. Figures supplied by the Statistical Branch, Army Medical Department, War Office, show that only four cases have been recorded for the years 1947 to 1951. Of these two were reported in 1948, one from the Middle East and the other in the U.K. A third case was reported from B.A.O.R. in 1950, and the fourth in 1951 from U.K. The following are the number ot cases recorded by the Royal Air Force : 1943, 2 ; 1946, 1 ; 1947, 1.

CASE NOTES

P. S., a regular senior non-commissioned officer with 16½ years' service, age 31 years, unmarried, was admitted to hospital for investigation as he had difficulty in carrying out rifle drill. Some six months prior to admission to hospital on 29th February, 1952, patient noticed weakness in both wrists, which had been getting progressively worse.

Past History.—Patient was the elder of two sons. His father died in 1929 from the effects of being gassed in the 1914-18 war. His mother died from heart trouble in 1934. His brother is alive and well. No history could be elicited of mental illness, blindness, or any nervous disorder in the family. When the patient was three years old he had a severe attack of measles, and had thereafter difficulty in seeing with his right eye. He has worn glasses as long as he can remember. He suffered from occasional colds. At the age of 21 he cut his head when diving into a swimming bath. There was no history of possible venereal infection. He did well at school and won a scholarship when 13 years old. On leaving school he joined the Army and has had a distinguished and satisfactory service record.

Present History.—He alleges that about five years ago his friends drew attention to his peculiar stamping type of gait. He himself paid little attention

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to it, as it did not worry him. Some six months prior to admission he noticed weakness in both wrists. This weakness became more noticeable, and he then observed his right forearm getting thinner. When doing rifle drill a week prior to admission, he discovered that he could not lift his rifle, or carry out routine drill with it. It was for this reason that he reported to his medical officer. He has shaved daily since he was 18 years old. He has a high moral code and has never been troubled by sex, having no interest in women or any desire to get married.

Examination

A thin, dark-haired man of asthenic build and sallow complexion, wearing glasses and appearing older than his years. He exhibits a myopathic facies (Fig. 1). His hair is thin and there is frontal baldness. He has, however, strong

Fig. 1.—(a) Typical Myopathic Facies; (b) Attempting to Smile.

facial hair and normal male distribution over the rest of the body. Ptosis is present in both upper eyelids. There is wasting and weakness of the facial muscles and of the sterno-cleido-mastoids in the neck. The temporal muscles and masseters appear in good condition. There is loss of tone, together with wasting and weakness in the muscles of the forearms, which is more marked in the dorsiflexors of the wrists. The ulnar and hypothenar eminences are wasted, and all the muscles of the hand are wasted and weak. The handclasp is definitely myotonic. In the lower limbs, there is less loss of tone with slight wasting and weakness of the quadriceps and marked wasting and weakness of the dorsiflexors of the feet and the right peroneal muscles.

Eyes.—Pupils central, circular and equal. React normally to light and accommodation. Eye movements normal. Visual fields normal. Visual acuity R. 6/60, L. 6/9. Fundi, nothing abnormal detected.

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Reflexes.—Upper limbs—triceps, biceps and supinator absent on both sides ; *abdomen*—present ; *lower limbs*—knee jerks and ankle jerks present and equal ; *Babinski*—Flexor plantar response.

Sensation.—Nothing abnormal detected.

Gait.—The patient walks with a high steppage gait characterized by marked "slapping" of the feet on the ground.

Other than the above findings, nothing abnormal was detected in the central nervous system. Thyroid palpable but does not appear enlarged or nodular. Penis appears normal in size and scrotum well developed. The right testis is atrophied and hard, and testicular sensation diminished compared with left testis. The latter is normal. Nothing abnormal could be detected in the lungs, heart or abdomen.

Mental State.—His stream of talk is relevant, rational, logical and coherent. There is no evidence of disordered thinking. His mood is one of anxiety and apprehension, and congruous with his thought content. He is of average intelligence and there is no evidence of mental deterioration. Memory is intact. Concentration and attention unimpaired. There is no evidence of any psychosis.

Special Investigations

Eyes.—External examination of eyes shows some slight exophthalmos, probably due to some loss of orbital fat ; otherwise normal. Slit lamp shows posterior polar cupuliform cataracts right and left, brown in colour but with no polychromatic lustre. Amblyopia of right eye since childhood.

X-Ray of Skull.—Small sella turcica and calcification of interclinoid ligaments.

Cerebrospinal Fluid.—Fluid clear and not under pressure ; Gram's stain, nothing abnormal seen ; Ziehl-Neelsen, no acid-fast bacilli ; culture, no growth ; sugar, 65 mg. per cent.; chlorides, 725 mg. per cent.; proteins, 20 mg. per cent.; Pandy's test, negative.

Electrical Reactions in Muscles (10th March, 1952).—These show a myotonic response in both upper and lower limbs. Both tibiales anteriores fail to react.

Certain muscles responded normally to galvanic and faradic stimulation. Others showed reaction of degeneration, while isolated muscles, particularly of the peroneus longus, deltoid and triceps, showed a myotonic reaction, the galvanic contraction lasting for about five seconds after the current ceased to flow. The muscles of the thenar eminences in both hands and the left tibialis anterior gave no response to either galvanic or faradic stimulation.

Comments

Onset.—The onset of dystrophia myotonica is usually in the third or fourth decade. The symptoms and signs in this patient first presented themselves in the second decade.

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There is usually a history of cataract in the preceding generation in the same family. No such history could be elicited in this case.

One of the most impressive features of the disease is the insidiousness of the onset and the slowness with which it progresses. This probably accounts for the apparent insensibility and indifference of the patients to their physical disability until the disease becomes well established.

The literature on the disease indicates that the symptoms vary between myotonia, muscular weakness and defective vision. The case here presented complained initially of muscular weakness.

Muscular Atrophy.—The muscular atrophy involved especially the facial muscles, the sterno-cleido-mastoids, the muscles of the forearms and hands, the extensors of the legs and the dorsiflexors of the feet.

Myotonia.—The myotonia in this case was most marked in the handclasp. It was elicited also by percussion in the deltoids, triceps and peronei. One of the earliest groups of muscles to show this reaction is usually the tongue, but in this case no myotonia could be elicited there. In contrast to myotonia congenita (Thomsen's disease), in which the myotonia is generalized, appears earlier and is the only disability, the myotonia in this disease is limited in distribution and overshadowed by the progressive muscular atrophy. The myotonia is, however, characteristic and diagnostic.

Extra-Muscular Dystrophic Signs.—These consisted mainly of frontal baldness, atrophy of the right testicle and opacities in the lenses. Although mental changes are described in textbooks, *e.g.*, Brain (1951), this patient showed no evidence of any mental deterioration. Caughey and Brown (1950) describe endocrine disorders in this disease, including the presence of a small sella turcica, which in some cases was bridged by an area of calcification. The case here presented did show a small sella turcica with calcification of the interclinoid ligaments.

Summary

A typical case of dystrophia myotonica in a regular N.C.O. is described.

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A CASE OF URINARY BILHARZIASIS CAUSED BY S. MANSONI AND S. HÆMATOBIUM WITH NO INTESTINAL INVOLVEMENT

BY

Lieutenant N. M. COWAN, M.B., Ch.B.(Edin.)

Royal Army Medical Corps

THIS case is considered worthy of publication, partly on account of its rarity, and partly because no record of a similar case in an East African can be found in the literature.

The patient was a native of Dar-es-Salaam, Tanganyika, aged 20, who was admitted to the Medical Reception Station, Nakuru, Kenya, on 2nd April, 1952.

Family History.—He stated that his father, mother and brother had all suffered from hæmaturia. There was no history of tuberculosis in the family.

Past History.—He gave no history of any previous illness apart from an attack of diarrhœa, in 1950, of two days' duration, no blood being passed in the stools.

History of Present Illness.—When admitted to Nakuru, on 2nd April, 1952, he complained of hæmaturia accompanied by pain on micturition, of one week's duration. The hæmaturia occurred towards the end of micturition and was accompanied by the passage of a few small clots. The pain was situated in the suprapubic region and radiated to the tip of the penis, being of intermittent and griping character. There was no history of pain of renal, ureteric, or testicular origin, nor had there been any urethral discharge.

Examination.—The patient was well developed, his weight being eleven stone six pounds. Palpation of the abdomen revealed no tenderness or rigidity, either in the suprapubic or renal regions, nor was there any enlargement of liver, spleen or kidneys. No urethral discharge or testicular abnormality was found.

No abnormality was found on examination of heart, lungs or central nervous system.

The patient exhibited no pyrexia, and his pulse ranged around 52 per minute.

Urine Examination.—The urine was darkly stained with blood. Microscopic examination revealed numerous red blood cells, pus cells and a few epithelial cells. One ovum of *S. mansoni* was found on 14th April, 1952, but despite

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examination of the centrifuged deposit thrice daily for one month, no further ova were seen until 14th May, 1952, when eggs not only of *S. mansoni* but also of *S. hæmatobium* were discovered.

Repeated examinations of stools were carried out, but no ova, pus cells or red blood cells were seen, and the stools were of normal appearance.

A blood count on 15th April, 1952, showed red cells, 4,200,000 per c. mm.; hæmoglobin (Sahli), 98 per cent.; differential leucocyte count, neutrophils 40 per cent., lymphocytes 52 per cent., eosinophils 8 per cent.; E.S.R. (Wintrobe) 12 mm. in one hour. (Total W.B.C. count on 23rd March, 1952, showed 6,800 cells per cu. mm.)

Cystoscopy was carried out at the Military Hospital, Nairobi, by Mr. Barber, F.R.C.S., who reported that the right ureteric orifice was obscured by active bilharzial nodules and that there were scattered nodules around the left ureteric orifice and the fundus of the bladder. Sigmoidoscopy was not performed.

Straight X-rays of kidneys and bladder taken on 22nd April showed no abnormality. Intravenous pyelography was attempted, but unfortunately proved unsatisfactory owing to the presence of gas in the colon.

Discussion

The rarity of pure double vesical infection of *S. hæmatobium* and *S. mansoni* is revealed by the statistics of Khalil (1926), who found this condition in only 48 individuals out of 7,090 examined in Egypt, and by the observations of Fairbairn (1928), who stated that he knew of only two references to its existence.

The presence of *S. hæmatobium* in the urine of the present case confirms the theory that if *S. mansoni* is present in the bladder, *S. hæmatobium* is demonstrable at the same time although it does not necessarily reveal itself in the urine (Gelfand, 1950). The case described is also of interest in that the ova of *S. mansoni* were found in the urine but not in the stool.

It may be argued that the hæmaturia in this case resulted from some other lesion apart from the helminth infection discovered, but it is considered that this, though possible, is unlikely in view of the absence of any other demonstrable condition in spite of exhaustive investigation. Moreover, the eosinophilia is in favour of a helminth infection.

I am indebted to Colonel W. G. S. Foster, *O.B.E.*, late R.A.M.C., for permission to publish this case and to Dr. A. Charters, M.D., M.R.C.P., for his valuable help.

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Matters of Interest

SOCIETY OF MEDICAL OFFICERS OF HEALTH, SERVICES GROUP

For the fourth year in succession, the annual meeting of the Group was held on 20th February, 1953, at the R.A.M. College, by kind invitation of the Commandant, Major-General F. R. H. Mollan, *C.B.*, *O.B.E.*, *M.C.*, Q.H.S.

Major-General T. Young, *C.B.*, *O.B.E.*, M.D., D.P.H., Q.H.P., the President of the Group, opened the proceedings by expressing his appreciation of the facilities afforded to the Group by the Commandant and staff of the R.A.M. College.

An excellent film on *Korea* was then shown by Major J. M. Adam, B.Sc., R.A.M.C., who had taken it himself and who very kindly gave a running commentary.

The members then adjourned to the Army Health Laboratory, where some very interesting demonstrations had been prepared for our benefit by various departments of the Directorate of Army Health (War Office) and of the R.A.M. College.

A. M. D. Stats. dealt with *Punched Card Techniques in Army Medical Statistics:* the practical side of this subject was shown by means of a specially staffed Demonstration Van, kindly placed at the disposal of the Group by the British Tabulating Machine Co. Ltd.

The Physiologist attached to the Directorate of Army Health showed the value of *Finger Tremor* in the assessment of fatigue, and the method of recording it. It was most amusing to watch the anxious looks on the faces of various members, who had volunteered to have their own finger tremor recorded, while "the moving finger writ."

The Pathology Department of the R.A.M. College had a valuable and extremely informative exhibit on the scope and extent of *B.C.G. Vaccination in the Army*, while the Department of Tropical Medicine showed us a series of fascinating "aids" used to help the benighted student grasp the awesome mysteries of *Entomology*.

The exhibits by the Department of Army Health covered a wide range of subjects. The search for the ideal *Mosquito Net*, as regards mesh, shape and material, was traced in a comprehensive and inimitably witty display which spanned the ages from Pepys to the "girl in the turquoise tutu" of the latest nylon advertisements. The old motto "Cave Canem" was brought to mind by another exhibit, which in a delightful mixture of bantering humour and scientific

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earnestness, set out the case for (and against ?) branding *The Dog as a vector of disease*. The *Malaria* exhibit consisted of an excellent synopsis, amply illustrated, embracing the world-wide incidence of the disease, and the methods of control and treatment. Yet another displayed the *Poison Test Case* in current use in the British, Canadian and U.S. Armies. Finally, the section on *The Soldier's Accommodation*, largely made up of photographs, designs and plans, depicted the housing of Tommy Atkins in barracks, in the field and in married quarters; it included some excellent models kindly lent by the Director of Fortifications and Works (War Office).

At the conclusion of this demonstration, refreshments were served in the College Library, where further exhibits had been prepared. *Salute to the Navy* and *The Story of Brucellosis* were based on books and documents belonging to the College Library. The former showed a collection of scientific works by distinguished naval surgeons, including Blane and Lind. The latter included some works of great historical value like Bruce's *Notes on the Discovery of a Micro-organism in Malta Fever* and Hughes' *Mediterranean, Malta or Undulant Fever*. To round off the evening, a light note was struck by a series of *Spots as seen by R.A.M.C. Students*. One saw, in the contents of the Horrocks' Box, an undoubted incentive to the young officer to take up Army Health as a career !

T. A. P.

ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE

A LABORATORY Meeting of the Royal Society of Tropical Medicine and Hygiene was held at the Royal Army Medical College on the evening of Thursday, 19th March, 1953.

More than 200 Fellows and visitors attended and inspected the various demonstrations which completely filled the Pathology Laboratory of the College.

The Department of Tropical Medicine and Medical Entomology showed two exhibits :

(1) Daraprim treatment of benign tertian malaria ; and

(2) Teaching methods in Medical Entomology.

Other exhibits came from the London School of Hygiene and Tropical Medicine, the Ross Institute, and the Liverpool School of Tropical Medicine.

After the meeting, coffee and sandwiches were served in the College Library. All present agreed that the meeting was a very great success.

W. R. M. D.

TROPICAL DISEASES BULLETIN, 1921-1953

AT the beginning of this year, the *Tropical Diseases Bulletin* entered its fiftieth volume. We congratulate the *Bulletin* on the services it has rendered to tropical medicine during these thirty-two years, and we hope it may long be able to continue its useful work.

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R.A.M. COLLEGE—EXAMINATION RESULTS

THE following officers have obtained the Diploma in Tropical Medicine and Hygiene :

Lieut.-Colonel A. R. T. Lundie, Majors H. G. Skinner, I. M. Grant and D. E. Marmion, and Captain S. A. Biggart, R.A.M.C. ; and Lieut.-Colonel Anwar-ul-Islam, Pakistan Army Medical Corps.

PAPERS BY R.A.M.C. OFFICERS

Bensted, Lieut.-Colonel H. J., and J. D. Atkinson : Hydatid Disease. *Lancet* (1953), i, 265-268.

Cantlie, Lieut.-General Sir Neil : The Medical Services in the Korean War. *Lancet* (1953), i, 294.

Carter, A. Barham : Unfit for Military Service. *Lancet* (1953), i, 292.

Pozner, Lieut.-Colonel H. : Psychiatry in the British Army in World War II. *Medical Bulletin* (May and Baker), April, 1953.

Trafford, Major P. A. : Uterine Chorion-Epithelioma. *Brit. Med. J.* (1953), i, 199-200.

Book Reviews

THE PHYSICIAN'S GUIDE TO CHEMOTHERAPY. By Peter N. Swift, M.R.C.P. Lond. Pp. xii+176. London : H. K. Lewis & Co., Ltd. 1952. 15s.

This is a valuable guide to antibiotic therapy. The various agents are described fully in the earlier part of the book, together with details of their pharmacology, toxicity, dosage and administration. Naturally, emphasis is laid on bacteriology and bacteriological diagnosis.

The greater part of the work is concerned with descriptions of the treatment of diseases and infections on an anatomical basis. There are sections on tuberculosis and tropical diseases. A comprehensive bibliography is included.

This volume is to be recommended to all clinicians.

W. R. M. D.

THE MANAGEMENT OF ABDOMINAL OPERATIONS. Edited by Rodney Maingot. Pp. xvi+1256. London : H. K. Lewis. 1953. 120s.

A large book of over 1,200 pages, containing chapters by thirty-three eminent specialists. The book is primarily intended for postgraduates and especially for the young surgeon under training or in the making.

Part I—of some 400 pages—is devoted to general considerations, such as venous thrombosis, the intricacies of milli-equivalents and the fluid balance, post-operative chest and urinary complications, etc.

Part II—of 700 pages—deals with the management of operations of particular organs and areas.

Part III contains only two chapters—on aseptic surgical technique, and on clinical pathological values and their changes in disease.

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There is a valuable list of references at the end of each chapter.

This is an excellent book to have when studying for the F.R.C.S. and to keep for reference. There is a tremendous amount of sound knowledge and advice to be had from all sections ; and the book will become a guide, counsellor and friend to those who consult it before embarking on any abdominal operation.

A. G. H.

Aids to Medical Diagnosis. G. E. Frederick Sutton, M.C., M.D., F.R.C.P. 7th Edition. Pp. viii+346. London : Bailliere, Tindall and Cox. 1953. 7s. 6d.

Once again this little book, a popular member of the "Aids" series, has been revised and brought up to date. It will remain a useful help to medical students commencing clinical work, but it is not full enough to be of much service to the house physician or practitioner. There is a new section on congenital heart disease. In the section on electrocardiography the voltage leads and unipolar limb leads are briefly explained, but elsewhere in the text reference is still made to "lead IV." In these modern times, when the collagen diseases are so much to the fore, it is somewhat surprising to find that the central nervous system is discussed in 94 pages whilst the diseases of joints are allocated merely 6 pages. The physical signs of the lungs and heart are well described, and new paragraphs on lung collapse and virus pneumonia have been added. The student will find this a useful book used in conjunction with one which covers the ground more fully.

R. J. G. M.

Textbook of Public Health. W. M. Frazer, *O.B.E.*, M.D., Ch.B., D.P.H. 13th Edition. Edinburgh : E. and S. Livingstone. 1953. 42s.

The latest edition of this well-known text-book, which appears for the first time under the sole authorship of the distinguished M.O.H. of Liverpool, maintains the high standards so firmly established by its predecessors. The bias is still in favour of the social and personal aspects of Hygiene, which are expounded in a very able and exhaustive manner, although the environmental side is by no means neglected.

While one hesitates to find fault with the work of such an illustrious author, mention must be made of his advocating such out-dated measures as disinfectant gargles for poliomyelitis patients and contacts, and the disinfestation of the clothing of scabies patients.

It is felt that the Act referred to at the top of page 214 should have been the National Insurance (Industrial Injuries) Act, 1946, and not the Workmen's Compensation Acts as stated. Similarly, the list of diseases given on this page is surely a list of prescribed diseases according to the National Insurance (Industrial Injuries) Act, 1946, and not, as one would think from what is stated on the preceding page, a list of industrial diseases notifiable under the Factories Act, 1937.

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It seems a pity that, in a text-book dated 1953, the latest figures of Maternal Mortality and Still-birth Rates should be for 1943, and that it was not found possible to refer to the new Public Health (Ships) Regulations, 1952, and Public Health (Aircraft) Regulations, 1952, or at least to the new International Sanitary Regulations which were adopted by the W.H.O. in May, 1951.

Other omissions noted were the Factories Act, 1948, break-point chlorination and reference to the fact that Food Poisoning is a notifiable disease.

In spite of these comparatively minor shortcomings, however, this book remains a very useful guide and companion to the student and practitioner of Public Health.

T. A. P.

SYMPTOMS AND SIGNS IN CLINICAL MEDICINE. By E. Noble Chamberlain, M.D., M.Sc., F.R.C.P. 5th Edition. Pp. 480, with 354 illustrations. Bristol: John Wright & Sons Ltd. 1952. 35s.

The appearance of a 5th edition of this well-known book is welcome and is testimony to its universal popularity. Considerable revision has taken place and a number of new illustrations have been added.

Though written primarily for the student as an introduction to medical diagnosis, the book should be owned by every young physician. I strongly recommend that candidates for the senior course at the R.A.M. College should study it.

The text, illustrations (of which 19 are in colour) and publication are of a high order.

W. R. M. D.

MEDICAL EMERGENCIES IN MEDICAL PRACTICE. Edited by C. Allan Birch, M.D., F.R.C.P. 3rd Edition. Pp. 587. Edinburgh: E. & S. Livingstone Ltd. 1952. 32s. 6d.

Medical books devoted to the treatment of emergencies are few in number and this one can be said to cover all the conditions calling for immediate action other than surgery. It brings within the compass of a single volume information which is scattered over text-books on medical therapeutics.

The clinical descriptions of these emergencies and especially the criteria of diagnosis and details of treatment are excellent. This new edition includes the anti-coagulant treatment of coronary thrombosis and brings up to date the chapter on medico-legal emergencies. In the section on practical procedures at least five types of artificial respiration are mentioned, but there are no details of the Holger-Nielsen method. Now that this method has been adopted in both military and civil practice, a full description of it should be included.

Several coloured plates have been added and other illustrations improved. The editor and publishers are to be congratulated on producing an admirable reference book.

W. R. M. D.

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MEDICINE. VOL. I: THE PATIENT AND HIS DISEASE. A. E. Clark-Kennedy, M.D., F.R.C.P. 2nd Edition. Pp. xiv+410. Edinburgh: E. & S. Livingstone. 1953. 25s.

This most stimulating book approaches medicine from a philosophical yet essentially clinical point of view and is quite different to the ordinary text-book. No disease entities are described but rather the reaction of the patient to the causal factors which bear upon him and the symptoms and signs produced. It is designed to produce the maturity of mind which considers the sick man to be an individual and not a "case." This book is highly recommended to post-graduate students in all branches of medicine.

THE PHYSIOLOGIC EFFECTS OF WAR WOUNDS: SURGERY IN WORLD WAR II. Office of the Surgeon-General, Department of the Army, Washington, D.C. 1952. $3.50.

Seven specially selected officers with wide experience in clinical investigation and in critical observation in the laboratory constituted the board.

They have done a vast amount of work and have recorded much valuable information concerning the latent consequences of wounds as they influenced organic function and produced changes in blood volume and chemistry and abnormalities in the urine. This is of interest to both surgeons and pathologists.

The chapters on the frequent occurrence of renal failure in severely wounded battle casualties are full of useful information, especially as regards management and treatment.

The chapters on the Crush Syndrome in Battle Casualties make profitable reading.

Unfortunately there is little record of the clinical aspects of wound shock.

R. A. S.

APPLIED PHYSIOLOGY. Samson Wright. 9th Edition. Pp. 1,128. Oxford Medical Publications. 1952. 50s.

This edition is in effect a new book.

It covers every conceivable aspect of physiology and is of considerable value to both physicians and pathologists. Although not giving technique in detail, it gives the *raison d'etre* and the normals for most of the clinical pathological laboratory tests apart from bacteriology. The paragraphs on isotope "tracers" are most interesting, intriguing and entirely up to date. Subjects from embryology to modern dietetics are covered, but one felt the preponderance of very involved chemistry, to the partial exclusion of other matter, was a pity. One could quarrel with some of the remarks on the Singapore Captivity. Those that did not go on the railway may have fared better, but one doubts the statement: "During the first three years the diet was not seriously short of protein and fat." Obstetricians and histologists might not agree on the author's classification of the stages of the menstrual cycle.

It is, however, a valuable, interesting reference book for pathologists, physicians and physiologists.

L. R. S. M.

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GUIDE TO ARMY OFFICERS' PAY, ALLOWANCES AND FINANCIAL AFFAIRS. Captain W. B. Wilton, *M.C.*, R.A.P.C. 2nd Edition. Pp. xi+150. Aldershot: Gale and Polden. 1953. 5s.

The author set out to furnish "Instructions to Mariners" for officers, men and women, navigating the shoal waters of the Pay Warrant, Allowance Regulations and other sources of authority affecting their emoluments. He has admirably succeeded, with this comprehensive survey of the whole range of an officer's service income, from advances on first commissioning to widows' pensions, giving clear instructions on basic rates and indicating where information on exceptions may be found. The publication of a second edition only fourteen months after the first shows the need for a reliable guide to the kaleidoscopic regulations and this little book's value in filling it.

J. B. N.

ROYAL INFIRMARY, EDINBURGH

Due to the extension of the Medical Curriculum from 5 to 6 years, there will be several House Officer posts vacant on 1st October, 1953, in the Royal Infirmary. Applications stating age, qualifications, previous experience and the names of two referees, to the Medical Superintendent, Royal Infirmary, Edinburgh.

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Original articles, notes and letters bearing upon either the medical or the military aspect of the work of the Corps will be gladly received. All papers intended for publication should be typewritten (*not* duplicated), double-spaced and fully corrected. Proofs are not sent to authors serving out of the United Kingdom.

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Twelve off-prints will be sent to contributors of all main articles. Additional off-prints will be supplied on payment if ordered when the manuscript is submitted.

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Changes of address and rank, which should be promptly notified, and communications regarding subscriptions, etc., should be addressed to "The Manager, Journal of the Royal Army Medical Corps, Royal Army Medical College, Millbank, London, S.W.1."

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LIEUT.-COLONEL J. B. NEAL, T.D., R.A.M.C.

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Journal
of the
Royal Army Medical Corps

Original Communications

THE PRIVILEGES OF A LEARNED PROFESSION

A LECTURE DELIVERED AT THE R.A.M. COLLEGE ON 23rd APRIL, 1953

BY

Sir FRANCIS FRASER
Director, British Postgraduate Medical Federation

SHORTLY after the end of the Second World War and the general election which was won by the Labour Party, I was travelling by train in the company of the Vice-Chancellor of one of our larger universities. Our conversation turned on the great changes that had taken place and were then taking place in the political field and the resulting alterations, amounting to upheaval, in the social conditions of this country. We realized that these were the outcome of influences that had been gathering strength for many years past and were not temporary but would persist and develop still further no matter what political party might be in power. We considered their implications in the field of university education and agreed that the universities have the responsibility to prepare their graduates to become efficient citizens under the new conditions and to lead and guide the country and their fellow men to make the upheaval a successful one. We believed that the universities would have to modify their academic policies in order that the most good to this country and to humanity might be the result of the revolution that was taking place around us. I expressed the opinion then that medical education, both undergraduate and postgraduate, must share in these changes along with other fields of university endeavour, for the medical profession would certainly find that it would be affected by the social changes as well as by the astonishing scientific progress of our time, and that it could play an important part in helping the revolution to run its course smoothly and so to develop that

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humanity should gain, and progress towards happiness and a better life. At that time these were vague ideas, but the events of the six or seven years that have passed since then have strengthened my belief that the medical profession has an important place in the scheme of life now and in the immediate future, which it is not filling as well as it might. I propose this afternoon to try, if I can, to make these ideas less vague though, I fear, still far from clear.

Numerous authors of books and essays have in recent years attempted to analyse the troubles of our times and to discuss what is wrong with modern society and with the individuals that compose it. They suggest how these wrongs could be righted, and their proposals include remedies, such as better housing, economic reforms, more education and alterations in many more of the material conditions of the Welfare State, and most of them include religious, moral and ethical reforms. The only point on which all agree is that there is something wrong. There is a remarkable absence of self-congratulation and conceit, except when technical developments and scientific progress are under discussion. Almost without exception they conclude that man's sense of values has become distorted, and that the changes that have occurred in the past fifty years have not all been progressive.

Medicine, a Learned Profession

At the beginning of this century the term "professional class" was frequently employed as a designation of respect and honour, and those to whom it was applied were of importance in the community. Now it is a vague description with indefinite meaning, and seldom used. This is probably because so many forms of employment are now described as professions and many groups of persons engaged in various forms of employment claim to be regarded as professions. A profession may be defined as a group of persons exercising a skill and controlled by an association that lays down certain minimal requirements of qualification in terms of the nature and duration of training. Within a profession so defined there may be more than one association with different requirements so that some members may have acquired a practical skill only, while others have received a training also in the principles on which the skill is based. Obvious examples are nursing, engineering and accountancy, while those for which a practical skill only is required are numerous and are hardly to be distinguished from trades.

The increase in the number of professions is due to the development of specialization and to the community's demand for experts in many fields of activity, and this is a consequence of the great increase in knowledge that has resulted from the use of the scientific method, and the application of this knowledge in the daily life of man, both in his work and in his home. The increase in the number of professions is then to be welcomed as indicative of man's progress even though the title may have lost something of its former significance and implication. And yet, the term "professional classes" as employed fifty years ago had a meaning that should not be lost sight of as it was almost synonymous with the Law, the Church and Medicine, and it included also, I think, officers of the

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Royal Navy and the Army. The Law, the Church and Medicine still require to be differentiated from the new professions and are now perhaps best described as the Learned Professions, though the description is not entirely satisfactory for many of the newer professions not only include many learned persons but require also a standard of education as least as high as the Law, the Church and Medicine.

These three, however, differ fundamentally from the others and deserve a distinctive title. The members of no other profession have the same intimate relations with individual members of the human community as have the lawyer, the parson and the doctor. By virtue of their membership of one of these professions, each is accepted by their fellow citizens as trustworthy to receive their confidences and to know the inner secrets of their souls. In this they stand apart from all other groups of persons.

In recent years there has been a striking change in the relation of the clergy and the people. Each individual member of that profession has constant, intimate and friendly contact with numerous persons and families whom he can help and who welcome his advice and guidance, but the number of persons who are in this relationship with a clergyman and who look to him as their natural councillor and family friend is relatively very small. The influence of the clergy on the thoughts and actions of the people is but a fraction of what it was a generation ago and almost negligible in the community as a whole. It is, I think, true that the average member of the community consults his lawyer rarely and, when he does, it is usually for a limited and specific purpose only. When he does, it is frequently an occasion of critical importance in his life or in his relations to the society around him, and the wise family lawyer can exert considerable influence, but on the whole the members of the legal profession are not in a position to influence through their contact with individuals the thoughts and actions of the people to any great extent.

The doctor, on the other hand, is in much more frequent relationship with each individual and each family throughout the community. He attends each person at his birth and at his death. Vaccination, inoculations, infectious diseases, school medical examinations, and the numerous certificates required by the Welfare State bring the medical profession and the people into frequent contact throughout the life of the individual. More important still are the occasions of illness, when doubts and fears perplex and gnaw, with apprehensions for the future, for earning capacity, for ability to maintain accepted standards, for ability to launch their children in security. There may even be fear of death. Illness is always productive of emotional disturbances, of a search into the past for possible causes, and of examination and exposure of buried secrets. On these occasions the doctor is a very welcome visitor, the doubts and burdens are shifted to his shoulders, and the worries are lessened or resolved. By his professional knowledge and skill he may save life, relieve pain and restore health, by his example he restores confidence and from his experience he advises how health can be maintained in the future. He will have learned much about the social and personal life of his patient and of the family and he will have added to his knowledge of human beings, their biological, social and economic conditions.

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This, surely, is a position of great responsibility and peculiar privilege which is accorded to no other profession, to no other group of persons. Is the Medical Profession trained to accept this responsibility ? If the answer is "yes," and I think it is, are we ready to repay the community still further for granting us this unique privilege ? To that question the answer cannot be given with the same confidence, I believe.

The Doctor's Privilege

This privilege is the consequence of the doctor's professional knowledge and technical skill whereby he is able to relieve physical suffering and restore health, but his education has equipped him for wider services to the community. It is not yet 100 years since the minimum study and training required for registration to practise was established. Before that there was much variation in the qualifications of medical men and only a few received a university education, usually in the humanities and before proceeding to study medicine. After 1858, it became necessary to follow a required curriculum and that is now only obtainable in a medical school of a university, so that all qualified medical persons have had five or more years of university education.

There has been much discussion and many statements on the purpose of a university. In a recent address, Dr. Goodhart, the Master of University College, Oxford, said :

> "What are we entitled to expect from the university man who has undergone its intellectual training ? The list is not a long one. It consists of two qualities only, but they are of transcendent importance. The first is clarity and honesty of thought, and the second is intellectual curiosity."

Dr. Abraham Flexner in 1930 stated that the universities should be

> "conscious of four major concerns : the conservation of knowledge and ideas ; the interpretation of knowledge and ideas ; the search for truth ; the training of students who will practise and 'carry on'."

These are the aims and purposes of universities whatever the subject of study and they depend on the attitude of the teachers and students who together make up the university and are working for a common purpose. It is in these that a university differs from a technical school where the student is taught how something is done. In a university he is taught not only how something is done but also why, and so he must learn also how his subject is related to the lives of men and to the ideas by which men live. These studies of humanity were the foundations on which our predecessors based their medical education.

Medicine is peculiar among university studies. A medical degree is accepted as a qualification for registration to practise, and the curriculum and the examinations must be such as to be acceptable to the General Medical Council in order that the latter may be satisfied that the graduate has at least the minimum of technical knowledge and skill required. This is, of course, a necessary safeguard in the interests of the people, but it means that the community of teachers and students of which a university is composed is not entirely free to develop under-

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graduate medical studies and education as they think most desirable in the time available. As a result of the development of the scientific method and the great increase in knowledge there are also more exact facts for the student to acquire. Dr. Brotherston, writing in 1949, said :

> "New discoveries of scientific clinical medicine were so rapid and dramatic during the last fifty years that the technical approach to medicine has been given pride of place to the almost total exclusion of the social approach,"

and he had in mind the need for a better education in community medicine, preventive medicine and the maintenance of health. The progress of science has produced also an increase in specialization so that much instruction is limited to parts of the body and isolated functions thereby endangering the understanding of the human body and human life as a whole—and it is human beings that a doctor must care for throughout his career.

Accurate studies of human beings and their relations to their environment, to other human beings in their community, to their work, their leisure and to their homes are progressing. The social sciences, anthropology, psychology, genetics, sociology and many others that touch on these are being actively developed, but it is doubtful if they are yet ready to be included to any extent as formal subjects in the medical curriculum, though a beginning has been made.

In spite of these difficulties and deficiencies in medical education, a doctor is a person who has been selected by the community to receive the advantage of a university education. Fifty years ago acceptance for a university education depended largely on the student's ability to maintain himself financially ; now there are so many educational grants available from public funds that no student who is competent to make good use of the education provided by the Universities need fail to obtain it for financial reasons. He is selected at entry on his intellectual standard, and his potentialities for leadership, and at every stage in his university career it is on these grounds that he is judged, and selected or rejected for further opportunities. During the medical curriculum he may receive no formal instruction in the social sciences, but he is working closely with clinicians who bring to the management of their patients their practical experience of man's nature and his behaviour, and during the five years or more he spends in his medical school he is part of a university community of which the main purpose is to study man and his behaviour. Under such circumstances the receptive student gains so much from the example of those around him and from the educational methods of the university that by the time he graduates he is not only able to accept the responsibilities that the community has placed upon him to restore health and maintain it, and to prevent ill health, but is better educated and better placed than any other member of the community to do something more. Should the members of the medical profession not repay the privileges which the community has granted them by making a special contribution which they alone are in a position to make by helping their fellow citizens at this time of peculiar difficulty ?

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Man's Need for Guidance

The use of the scientific method and the great advances in accurate knowledge and technical skills have not only enabled the doctor to improve his methods of diagnosis and treatment, but have also so improved and quickened methods of communication and transport that man is no longer merely a citizen of his town, his county and his country. Events in any part of the world affect his mode of life and he is rapidly becoming a citizen of the world. His contribution by his work is no longer to his immediate community but must be correlated with that of millions of other workers throughout the world. This necessitates planning on a wide scale so that raw material can be brought to where it can be most advantageously used and the products of labour distributed where there is most need for them. At the same time, just as in medicine, so in all other fields of activity there is a greater need for expert work and a development of specialization, so that each individual is more and more limited to what the planners require him to do. He is becoming a small cog in one of very many wheels with little opportunity to know what the other cogs are doing or to appreciate the whole of which he is contributing so small a part. He has little chance to develop his individuality, to encourage his talents or his latent intelligence or skills. He is moulded to a pattern at school and in his gainful employment, and his leisure is becoming stereotyped also. The radio, the cinema, television and the popular Press provide him with potted instruction and entertainment to which he contributes nothing, and he partakes as a spectator in physical exercises performed by specialists. Loyalty to his trade union or association is the only service required of him, and that is loyalty to policies decided by a small minority of active members. Democracy seems to have gone awry, for instead of each contributing to the policies of the whole and the central authorities carrying out the wishes of the people, the individual now acts on instructions from above that hem him in, in every aspect of his life.

In an address in Edinburgh in 1952, Sir Alexander Gray, Professor of Political Economy in the University of Edinburgh, expressed this clearly when he said :

> "and Planning, as now understood, means among other things the removal of questions from the decision of the individual or the electorate to the decision of the expert who is, by definition, always right,"

and he ended his address with the warning :

> "I suggest to you, hesitatingly and for your consideration, that the Welfare State, in its unbounded benevolence, may find itself driven to a degree of regimentation and control which would make it in essence a government at least mildly totalitarian in character."

Now man is distinguished from other members of the animal kingdom by the size of his brain and especially that part of it associated with emotion and intelligence and he is characterized by initiative and enterprise. He is unable to remain static but must continually be seeking fields of further endeavour.

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Adventure is part of his being. The longing to convince himself of his individuality is strong and he feels oppressed by the conditions of his present existence. His need for healthy recreation for his mind and body seeks an outlet. Conformity with the herd is clashing with his need to make his personal contribution. He finds increasing difficulty in co-operating successfully with the other persons with whom he is in contact in his work and perhaps, too, in his family circle. There is a restlessness that can find no outlet and sooner or later the stresses and strains affect his bodily health and he is driven to seek the advice of his doctor, who in treating his bodily disorder has the opportunity to guide and advise him on how he may contribute to the new conditions and become a useful citizen of his country and of the world. Health cannot now be viewed in isolation from the conditions of politics and economics that are changing so drastically and so rapidly. The help and advice given to one member of a family will be shared by all and even by friends and neighbours, so that each doctor and each patient can be centres for the dissemination of guidance in good citizenship and this in time will contribute materially to the welfare of mankind.

How the Medical Profession can Help

It would be presumptuous if I attempted to suggest what guidance should be given, especially as it must clearly differ in each individual case, but perhaps I might venture on a few generalizations based on the outline already given of what is vexing mankind.

Health is indivisible, and physical, mental and emotional health cannot be considered apart from each other. If there is ill health in one of these aspects there is ill health of the whole, and in the present time of uncertainty and frustration it is in the mental and emotional fields especially that the dangers threaten the health of the community and of the individuals that compose it. We should strive to produce a balanced human being who can take pride in the dignity of his manhood, who takes proper care of his physical body, and who will be tolerant of other men. In this way only will he be able to fulfil the human urge for development and progress. In a recent volume, entitled "The Conduct of Life," Lewis Mumford pleads for the integration of :

> "The wisdom of the East with its practice of contemplation, the Greek heritage with its love of beauty and of reason, the Christian message of redemption and brotherly love, and the modern spirit with its respect for science, its recognition of the need for systematic planning."

The members of the medical profession can do much by their example of devoted service to their fellows and we should be conscious that in our privileged position we are an example to others at all times because of the sense of service and of tolerance that rules our own lives. But at this time especially our advice also can help greatly. The Welfare State and some degree of socialism have come to stay in this country, and, modified in varying degrees, are likely to spread throughout the world. The good citizen, the balanced human being, should accept this, no matter how he feels thwarted in his personal circumstances.

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Instead of standing to one side and trying to understand what is happening to himself, or perhaps following the herd without any attempt to understand the changes that are taking place, he should be encouraged to play his part and to influence what is happening. He should take his place in the new community, by attending meetings of the local branch of his union or association and influencing their decisions, he should vote for his parish council, his county council and for parliament and take an interest in their discussions, he should be encouraged to devote his leisure to developing such natural skills as he possesses, and he should be advised how he can keep himself physically fit. If he is artistic he should be encouraged to create, and the local authorities now provide adult education in art and many other subjects. I have seen a patient improve strikingly in bodily and mental health by acquiring a large and active dog, while another was able to return to a balanced life by joining the Roman Catholic Church. Their ill health was not the result of the social revolution, but I mention them as examples of the numerous ways in which a doctor can assist his patients, ways that he is not taught in his medical school but are the outcome of his general culture, his human sympathy and the breadth of his education. From this store of experience and wisdom he can himself remain a good citizen in this rapidly changing world and he can, by his example and his advice, guide those whom he has been given the privilege of influencing, so that they may not only adjust their lives successfully to the changing physical, political and economic conditions but themselves influence the developments that are still occurring and will continue in the future. But as Michael Graham, in his book entitled "Human Needs," points out :

> "The only safe course is to help, comfort and encourage people, rather than to interfere with them."

The medical officers of the fighting services are perhaps in the most advantageous position of all to influence mankind. You have the privilege of caring for the health of the youth of the nation at an age when it is especially susceptible of influence and when habits may be formed that persist throughout life. You are able to insist on bodily hygiene and are so successful in educating those in your care to improve their standards of physical health, to maintain health and to prevent disease—more successful I believe than any other branch of the profession—that you are in a position to extend your influence further and especially to the mental and emotional aspects of health, and thereby do much to educate in citizenship the leading members of the community of the future.

In conclusion, I would like to summarize what I have endeavoured, so inadequately, to present to you.

Members of the medical profession occupy a place of peculiar privilege in the modern community. They have been selected from among their fellows to receive a university education, and by reason of their professional knowledge and skills they have access to the people under conditions where they are better able than any other group of persons to influence men's lives and to guide them. Mankind is at present in a state of uncertainty as to the future and the individual must often conform to policies over which he has little or no, and only very

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distant, control. This is contrary to the nature of man which seeks adventure, progress and personal dignity. The medical profession has surely a duty to repay to the community for its privileges by offering example and guidance to assist man to contribute successfully by means of service, of co-operation and of tolerance in his new role as a citizen of a widening world.

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THE PHYSIOLOGY OF TEXTILES AND CLOTHING: A HISTORICAL NOTE

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Hippocrates on Clothing

The science of textiles and the physiology of clothing are often accepted as recent innovations, but close examination of the literature takes us back to early periods and to investigators whose works have been in some instances forgotten.

Nearly twenty-three centuries ago the Greek physician Hippocrates (460-370 B.C.), traditional father of Medicine, made some pertinent though obscure remarks in his essay on "Airs, Waters and Places" concerning the effect of the sun on sweating by the clothed body. We are told that ". . . as a strong proof of this, when a man walks in the sun, or sits down having a garment on, whatever parts of the body the sun shines on do not sweat ; for the sun carries off whatever sweat makes its appearance ; but those parts which are covered by the garments or anything else, sweat, for the particles of sweat are drawn and forced out by the sun and are preserved by the cover so as not to be dissipated ; but when the person comes into the shade, the whole body equally perspires" (1).

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"Insensibilis Perspiratio"

Some two thousand years later Santario Santario (1561-1636), commonly known as Sanctorius, Professor of Medicine at Padua, devised the earliest clinical thermometer and pulse clock. Sitting for long periods fully clothed in his steel-yard armchair, he weighed for the first time the "insensibilis perspiratio" or invisible perspiration of the skin (2). He may be regarded as the earliest investigator to measure quantitatively this variety of body water.

John Arbuthnot taught mathematics in London, later took a doctorate of medicine at the University of St. Andrews and became in 1705 Physician Extraordinary to Queen Anne. He tells us that he measured the temperature of the human skin with a thermometer made by his friend Stephen Hales, scientist and curate of Teddington (1677-1761). From various experiments Arbuthnot concluded that "the chilling effects of the wind are due to the dispersion of the warm and moist air which invests our bodies" (3). Many of us may feel chastened that this remark was made over two hundred years ago.

In classical periods a high level of hygiene prevailed, but in Europe during the Dark Ages, bathing of the body and washing of the clothes became a luxury of the few. Although the use of soap was well known to the Romans, it remained a rarity during the Dark and Middle Ages. The common people used as substitute wood ashes, nettles or even cow dung. It is therefore no small wonder that clothes were washed as infrequently as possible and that the outer garments and bedding were passed from one generation to another without being cleaned. Pungent perfumes were commonly used as a necessity.

In 1752 the German physician Joseph Zaccharias Platner wrote that the movement of the "insensibilis perspiratio" through the clothes was essential for health, and as a consequence he advocated frequent washings of the body clothing and bedding, an almost heretical doctrine in his day (4).

Physicist, Philosopher, Physician

The first scientific data gathered during the slow development of the science of clothing were due to another medical man, Joseph Black, Professor of Chemistry, and later of Medicine, at the University of Glasgow. He taught his students much, and published little. Nevertheless in verbal communications to the Newtonian Society of Edinburgh, on the subjects of Specific Heat (1760) and Latent Heat (1762), he produced conclusions from his careful work (5) which laid a path for those laws of thermodynamics upon which some of our modern ideas on body heat and the functions of clothing are based.

About this time Jean-Jacques Rousseau decried against the ponderously magnificent garments of the period before the French Revolution, stressing that it was more healthful to wear summer clothes in the winter. The critical Voltaire raised his voice against the coddling of infants with heavy clothes which he believed could lead to deformities. Alexander Pope, himself the son of a linen draper, wrote as follows in his Moral Essays :

> " 'Odious ! in woollen ! 'twould a saint provoke'
> (Were the last words poor Narcissa spoke)."

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After the French Revolution there was a strong movement in France towards the clothing simplicity of classic periods, and in imitation of the ancient Greeks and Egyptians it became the fashion to wear little but the finest and most transparent muslins. This may have satisfied the æsthetic inclinations of the gentlemen of the early Empire period, but it was followed by an epidemic of chills, catarrhs and phthisis. Diligent physicians were much disturbed by this vagary of the new freedom, and referred to the illnesses as "Muslin Disease."

Count Rumford and Textile Science

During the eighteenth century several monographs were published on various aspects of fabric and clothing by Schwartz (6), Kiesling (7), and Vaughan (8), but these did not add much to the scientific knowledge of their day.

The turning point in the history of textile science may be said to be due to a remarkable American, Benjamin Thompson, Count Rumford (1753-1814). In early life he considered embarking on a medical career, but instead became a teacher in the village of Rumford, New Hampshire, and studied physics in his spare time. His marked English sympathies attracted him to England before the War of Independence, and his remarkable gifts guided him into the Colonial Office, and afterwards to the post of Secretary of State. Although he received a knighthood from George III, he left his service and soon entered that of the Prince of Bavaria, to whom he became Minister of War, of Police, and Grand Chamberlain.

Despite much travel and many varying public commitments, Rumford found time not only to study but also to carry out investigations into diet and clothing, and on fuel, stoves and ventilation (9). He appears to be the first observer to stress the importance of convection in heat transfer, and to carry out research on what would nowadays be termed textile technology. In Munich, he performed experiments on the thermal insulation of clothing materials, wrapping them round a polished brass cylinder containing hot water and noting the time taken for the water to fall through a given temperature range as measured by a sensitive mercury Réaumur thermometer. In 1787 he recorded the unexpected fact that two thicknesses of cloth did not give appreciably more insulation than one. He clearly realized that air is the important insulator in clothing and stated that "heat is incapable of passing through a mass of air to penetrate from particle to particle."

Rumford's experimental work also led him to believe that dry air is a better thermal insulator than moist air. Later, in 1792, he demonstrated that more sunlight is reflected from a white than a black surface, adding that "white clothing is more fit to wear in a hot summer climate than is black clothing," a fact confirmed by his contemporary, Benjamin Franklin. Believing erroneously that a white surface was a poor radiator of the body's heat, he also advocated white clothing for cold weather, and was sometimes seen driving round Paris wearing immaculate white garments in the winter-time. He stressed the moisture-absorbing properties of wool, strongly recommending its wear near the skin, and was impatient with those who complained of its heating effect and skin irritation.

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The ideas of the great Rumford dominated thought in the new science for about a hundred years, and his data were often used as a final court of appeal even late into the nineteenth century. He founded the Rumford Medal of the Royal Society. We may regard him as the founder of textile science.

Heat Loss and Wind

Early in the nineteenth century when "trowsers" were beginning to replace breeches, a French physician, Clairain, wrote on the medical aspects of such clothing apparel (10), but his arguments did not greatly advance the knowledge of the day.

John Leslie, Professor of Mathematics and later of Natural Philosophy at Edinburgh, was a claimant of the Rumford Medal. He tells us that "moderate wind will quadruple the waste of heat, and a vehement hurricane is capable of increasing the rate of dissipation fifteen or twenty times; hence the keen impression of frost winds on our feelings" (11).

Leslie's remarks on the cooling of radiating bodies were to be repeated almost a hundred and fifty years later by Siple of America, in the form of graphs of "Wind Chill" (12).

In 1833 a Scots physician, John Stark, reported to the Royal Society his work on the influence of the colour of fabrics to heat and odours (13), and his conclusions have been much quoted by many hygienists who followed him.

The French physicist Péclet carried out careful investigations on the heat loss from cylinders and spheres (1860) (14), and his data are still referred to by modern workers concerned with the dynamics of heat loss from the cylinder-like extremities of the human body. This observer repeated the work of Rumford on heat loss of fabric-coated metal cylinders, but his results suggested that thermal insulation was independent of thickness or weave of cloth.

Val-de-Grâce: Lévy and Coulier

From this time onwards we note in our review an abundance of military hygienists, many of whom were medical men. Michel Lévy, Physician to Napoleon III and Inspector of Military Health, was Director of the Imperial Medical School at Val-de-Grâce; his excellent text-book of Hygiene first appeared in 1844 (15), and the third edition in 1856 contained a chapter of some fifty pages devoted to the Science of Clothing—De l'action des vêtements.

Coulier, Professor of Military Chemistry, and colleague of Lévy at the Val-de-Grâce, repeated in 1858 the work of Rumford and Péclet on the thermal insulation of fabrics (16), using much the same technique as that of his predecessors. We are told that he employed "un vase de laiton mince (thin brass) cylindrique de 500 cm., suspendu par des cordons de soie, dans un air tranquille, et fermé par un bouchon qui maintient un thermomètre très sensible."

This careful observer was greatly interested in the relation of water to textiles, and his observations led him to the conclusion that water vapour was absorbed into the fibre itself—l'eau hygrometrique—to condense as liquid with the evolution of latent heat: much more liquid water could, however, be taken

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up into the interstices of cloth—l'eau d'interposition. We may read in our modern text-books similar statements concerning fabric water, but it is difficult to realize that the facts are almost a century old.

Lévy himself carried out investigations on the effect of impermeable garments on the marching soldier, and came to the conclusion that such clothing was unsuitable as the man became a "wet stove" (17).

We may accord honours to Val-de-Grâce as the first School of textile science.

Later Hygienists and Pettenkofer

About the same period, Surgeon-General Hammond of the American Army published a text-book on Military Hygiene (1863) (18) in which he quoted freely the investigations of Lévy and Coulier. It is worthy of note that most text-books of hygiene of this period already gave good descriptions of the microscopic appearance of textile fibres.

Hammond repeated Rumford's and Coulier's experiments with a heated brass cylinder, and confirmed that wool was a better thermal insulator than cotton. He also discussed the value of light coloured materials for keeping off the rays of the sun.

During the Indian Mutiny of 1857-8, lack of scarlet coats for native regiments led to the introduction of local cloth of a less vivid colour (khaki, Hindustani—dust coloured). Having been found suitable, khaki was used later by British troops serving in hot countries, but the tactical and physiological advantage of a drab colour were not generally realized for some time.

In 1864 appeared the first edition of an important text on Military Hygiene by Edmund Alexander Parkes (19), first Professor of Military Hygiene at the Army Medical School, Fort Pitt, Chatham. He made no remarkable contribution to clothing science, but repeated the earlier observation of Stark concerning the absorption of odour by coloured fabrics, and wrote at length on the value of socks for the soldier. Parkes' detailed work on military equipment, however, played a most important role in the development of accoutrements both in England and on the Continent. He speaks in his text of the work of Troubridge, first Director of Army Clothing (1857), who was employing up-to-date machines for testing fabrics in the new Army Testing Establishment in Pimlico. Discussing malaria, Parkes notes that since the poisons undoubtedly enter by the lungs or stomach, there appears to be little object in wearing special clothing as a precaution against the disease. We accept this statement with understanding, for Parkes' military colleagues, Laveran and Ross, had not yet discovered the parts played by the parasite and mosquito.

It is often assumed that scientific work on textiles began with Pettenkofer, Professor of Dietetic Chemistry and later of Hygiene in the University of Munich ; but by 1865 when his investigations were published (20) the budding science was already well rooted and fast growing. Pettenkofer, poet, actor, medical man and scientist, was greatly interested in all aspects of human hygiene, whether of air, living rooms or garments. He contributed numerous quantitative tests for air- and water-permeability of clothing, and most succeeding authors

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freely quoted his results. Perhaps the most valuable function of this great Bavarian was to popularize knowledge of clothing science by means of public lectures (21).

Dr. Joseph Krieger, a friend of Pettenkofer, repeated the earlier work on thermal insulation, but used a cylinder of iron instead of the traditional brass (22). In 1877 he published his studies concerning the relationships of clothing properties to chills, inflammations and fevers (23). Morache, Director of Army Health to the French 18th Army Corps, in his work on Military Hygiene published in 1874 (24), devoted some fifty pages to all known aspects of clothing science as applied to the soldier. Roth and Lex produced in 1877 their massive work on Military Hygiene, and with usual German thoroughness dealt with the subjects of textile science and military garments in no less than one hundred pages (25).

During the next few years Linroth (26) and Hiller (27) wrote on water in fabrics and clothing, and of the effects of wet uniforms on chilling the soldier. Several other books and reports of importance enriched the literature. Pommay (28) and Schierbeck (29) were interested in air permeability of fabrics and the ventilation of garments ; Würster (30) described a small hygrometer for use under clothing ; Berthier and Kolb (31) described an artificial rain test ; Holbein (32) carried out early work on the bacteriology of undergarments, and Lang (33) and Schumburg (34) reported on the scientific background of underclothing which began to be generally used only towards the end of the nineteenth century.

The "Sanitary Woollen System" of Jäger

About this time a certain Dr. Gustav Jäger was very active in attempting to introduce a new civilization by his "Sanitary Woollen System" (35). However, long before his time many had pondered on the advantages or otherwise of various fibres and weaves. Before the end of the eighteenth century, Rumford and Gibbons (36) had written on the value of wool for garments, and Tual in 1838 discussed at length its various advantages (37). Johnson favoured cotton for underclothes (1861) (38), Augustin discussed the use of flannel (1874) (39), Gerster inquired into the relative values of linen and wool (1891) (40), and in the same year Rutherford declared for the "Sanitary Woollen System" (41).

Dr. Jäger, although a physician and zoologist by training, based many of his arguments on unsound principles. He wrote that wool stimulated the skin and in some way prevented the absorption into the body of a hypothetical "noxious principle" present in sweat. Only by wool, he said, could health be maintained. According to Jäger, woollens kept away the "ubiquitous flea and microbe" and attracted fragrant odours ! He added that vegetable fibres such as cotton and flax had the opposite properties and should certainly not be used in clothing ! The "Sanitary Woollen System" of Dr. Jäger is now forgotten although some of us wear clothing with which his name is still associated.

Rubner and Clothing Physiology

The unscientific verbiage accumulated by Jäger and his colleagues was removed by an important near-contemporary, Max Rubner, who, like his pre-

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decessor Pettenkofer, was a Bavarian. Rubner was a medical man and physiologist, and in 1891 became Director of the Hygienic Institute in Berlin. His first text-book on hygiene (42) was published in 1890, and his monumental Handbuch (43) which appeared in 1911 includes a chapter on clothing which to the casual reader appears quite modern. Rubner continued the work of his predecessors, and produced careful quantitative techniques for the measurement of air, water and vapour permeability, and for measuring the compressibility of fabrics. A number of his methods, in modified form, are still in use by some laboratories. He repeated the work of Coulier and Krieger on thermal insulation, using a Stefan calorimeter and recording the results in absolute units (44). Rubner found that insulation increased in proportion to thickness and came to a conclusion, new even today, that thickness is a fundamental property of fabrics—"Die Dicke der Stoffe ist ein Fundamentale Eigenschaft." Rubner extrapolated air permeability values to a thickness of 1 cm., a strange oversight on his part since all the fabrics used by him were much thinner. He formulated the principle that most natural fibres have similar physical properties which become modified in the weaves that can be produced from them. Thus we have his "primary" properties of the fibre and "secondary" properties of the cloth. He also stressed that air and moisture properties are closely linked characteristics of textiles. Continuing the researches of Coulier, Rubner again demonstrated the existence of two levels of water equilibria—that of vapour in relation to the fibre ("hygroscopische Wasser") and that of liquid in relation to the interstices ("zwischengelagerte Wasser"); he pointed out the latent heat value of the former, and the marked effect of the latter on thermal insulation by displacement of air.

But it was as physiologist that Rubner contributed most greatly to the science of clothing, and he showed firm conviction that much truth is missed if one limits investigations to a piece of cloth without considering the whole garment worn under realistic conditions. Rubner's work on metabolism had shown the importance of body surface area in relation to heat loss, and it was to the surface that he directed much of his energies (45). Measurements of skin temperature and of temperature gradients through the layers of clothing were recorded under a variety of environmental conditions, using thermocouples—"feiner Neusilber-Eisen Thermoelementen"—which were just beginning to be used in physiological work. In assessing the relative value of woollen and cotton socks, he took measurements from subjects wearing one type on each foot. Many of his contemporaries were highly suspicious of his interest in the human body and of his "tomfoolery with feet."

Rubner stated a fact not generally realized even today; a human when wearing clothes is not always a reliable judge of his own comfort. We claim Rubner as the leader of the new science of clothing physiology.

The Modern Period

During the early twentieth century, work continued sporadically on problems of hygroscopic heat and thermal insulation. Rodevald had shown in 1897 that the heat of hydration of starch was not entirely explained in terms of surface

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condensation phenomena (46), and suggested the possibility of a chemical mechanism. Masson and Richards in 1907 demonstrated that dried cotton wrapped around a thermometer bulb absorbed water from the atmosphere with a concomitant evolution of heat which could not be explained as due to liquefaction alone (47). Leonard Hill in 1920 referred to the schoolboys' trick of blowing up the sleeve or placing the head under the bed-clothes as a means of getting warm (48). With these earlier studies as background, the recent work of Baxter and Cassie (1941) on "sorption" heat (49) and its practical application to the human by Nelback and Herrington (1942) (50) is perhaps not unexpected.

From the heat flow cylinder of Rumford, Coulier and Krieger, and via the calorimeter of Rubner, emerged the wet Kata thermometer of Hill (48). Later was developed the oil-containing copper cylinder of Floyd and Baker (1925) (51); and the constant temperature copper plate of Sale and Hedrick (1924) (52), of Cleveland (1934) (53), and of Rees (1941). With Rees came the concept of the TOG value of a textile (54) as a measure of thermal insulation. Finally we arrive at the engineering feat of the "Copper Man" of Burton (1944) (55) and Hall (1946) (56), with its associated CLO unit of thermal insulation of the complete clothing ensemble. Excellent reviews on the present state of knowledge of the physiology of textiles and clothing are given in the publication of Newburgh (57) and in that of Winslow and Herrington (58).

Conclusion

Looking back on the path that has been traced it seems clear that from earliest times man has reflected much upon himself and the nature of his garments.

We sometimes smile indulgently at the efforts of our predecessors, but unless prepared to read what they have written, we may well lose time in going over ground already well trodden. It is perturbing to realize how much was known a century ago, and what a grasp of the principles of clothing physiology was held by Rubner over fifty years ago. It may be difficult, and at times impossible, to draw valid conclusions from the work of earlier investigators, partly because specifications of textiles were unknown to them, and partly because design of experiment and analysis of resulting data had not been evolved. Nevertheless, the principles laid down by Rubner and his predecessors have laid the foundation of the science of clothing physiology, and only by the close integration of physicist, engineer, textile technologist and applied physiologist or hygienist will the interrelations of fibre, weave, garment and body be made more clear.

The wranglings of the men of cotton, wool, and linen have long been forgotten, and we have learnt that for many conditions it matters but little what we wear near our skin. But for the soldier and for those exposed to extremes of climate, to wind and to rain, operational garments will for long be of prime consideration. Here lies work for the future.

Acknowledgments

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STUDIES ON URINARY CARRIAGE OF ENTERIC GROUP ORGANISMS

VII.—THE VALUE OF DIFFERENT CULTURAL METHODS FOR ROUTINE CLEARANCE TESTS AND FOR FOLLOW-UP INVESTIGATION OF CARRIERS

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Methods of urine culture for enteric group organisms and for the concentration of organisms of this group in specimens of urine were quantitatively evaluated by Archer and Ritchie (1950) in the first paper of this series. It was concluded that enrichment was probably unnecessary and could not be used exclusively, that direct plating, oxalate precipitation and primary fluid culture in an indicator medium ("MacConkey-mannite") should be used in carrier investigation work, and that assessment of the best methods for future routine use should be based on the results observed.

Williams Smith (1952) found selenite and tetrathionate superior to liquid desoxycholate-citrate, liquid Wilson and Blair, cacotheline broth and brilliant green peptone water for isolation of Salmonellæ from fæces. The use of either selenite or tetrathionate might reveal the presence of ten Salmonella organisms, while it was necessary to add several thousand Salmonellæ to fæces before they could be recovered by direct culture on desoxycholate-citrate-agar or Wilson and Blair solid medium. In general, isolation was easier from human and animal than

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from bird fæces, being easiest from horse fæces and most difficult from duck's, by each method. Different species of Salmonella varied in the ease with which they were recovered. ***Salm. cholerae suis*** and ***Salm. abortus-ovis*** were isolated more satisfactorily by direct plating than after enrichment. The combination of selenite and solid Wilson and Blair was sometimes too inhibitory, and there was little advantage in the substitution of mannite for lactose in selenite medium. Selenite was slightly better than tetrathionate; prolongation of incubation beyond 30 hours was detrimental with tetrathionate but not with selenite. Anderson and Richards (1948), however, found that under 18 hours' incubation was optimal for selenite, and that when this period was exceeded the number of colonies obtained on plate subcultures might fall. Browning *et al.* (1933) report direct culture as more successful than brilliant green enrichment for isolation of *Salm. typhi* from fæcal carriers. They attribute this to antagonism between carriers' coliform strains and *Salm. typhi*. Brilliant green was, however, found superior to direct culture for *Salm. paratyphi B*. These workers consider that the likelihood of recovering bacilli (late in enteric fever or during convalescence) when a few loopfuls of urine are cultivated daily for 7-10 days is so considerable as to make this a valuable method of investigation. As regards carriers, they quote Garbat as recommending 24-hour specimens owing to intermittency of excretion.

Taylor (1947) refers to the use of tetrathionate broth and desoxycholate-citrate-agar for urine culture in enteric.

Direct plating, selenite, and simple primary culture in an indicator medium, with subculture to desoxycholate citrate or MacConkey plates, were used in the detection and follow-up of carriers described in the second (Archer, Goffe and Ritchie, 1952) and fourth (Archer and Naylor, 1952) papers of this series. For a short time oxalate precipitation was also used. The comparative value of methods used in primary screening and in follow-up tests is recorded and discussed below.

Part I—Routine Screening

The routine detection of carriers was attempted, as earlier described, by culture of a pool of three specimens taken on consecutive days from each individual. Thus each inoculum consisted of urine from one individual only but was a mixture of three of his specimens. In an effort to determine whether this was liable to cause failure of isolation due to intermission (or variation in numbers passed) leading to over-dilution of positive specimens, the individual specimens from approximately every tenth person were cultured in addition to the pool. Such single specimens were sometimes not submitted to all the methods of culture in current use, however, and the results of their culture will be referred to only if of special significance in any case. The results obtained by the different methods are shown on Table I. Direct plating was usually to MacConkey but sometimes to desoxycholate-citrate-agar (D.C.A.). Culture of an oxalate precipitate was either direct or after passing through selenite. (Enrichment was suggested by Archer and Ritchie if the simple direct plating showed contamination, and this was generally done.) For a time both ordinary fluid

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MacConkey, containing lactose (MacC-L), and MacConkey mannite (MacC-M) were used, but the former was later discarded. Subcultures from either of these media were commonly made to both MacConkey and D.C.A. plates, but subculture was generally omitted if there was no evidence of fermentation of the mannite in the primary culture containing it. Cultures from cases IX, XXI, XXIV and XXVI (notes (*k*), (*t*) and (*q*) to Table I) showed the inconstant production of gas by aerogenic species discussed by Archer (1953) in the fifth paper of this series.

TABLE I.—RESULTS OF ROUTINE CULTURE FOR DETECTION OF CARRIERS BY THE METHODS SHOWN

(Case numbers in Roman numerals in Column 7 refer to this section of the paper only and bear no relationship to strain or carrier numbers used in previous papers or in Part III of this paper.)

Series	No. of Persons Tested (by culture of a pool of 3 specimens)	Method (D=simple direct plating. O=oxalate precipitation)	Isolations T=*Salm. typhi* isolated A=*Salm. paratyphi A* isolated C=*Salm. paratyphi C* isolated				Note reference
			No. of positive cultures	Pathogens isolated	Comment	Case Nos.	
A	69	D and O	Nil				
B	124	D	1	A and T	From one case	I	
		O	1	T	From a second case	II	
		MacC-L	3	A (only)	From case I	I	(*a*)
				T	From case II and a third case	II III	(*b*) (*c*)
		MacC-M	3	?	From case I	I	(*a*)
				T	From cases II and III	II III	(*b*) (*c*), (*d*)

NOTES TO TABLE I

(*a*) Numerous suspicious colonies on subculture, but sugar reactions atypical on first test. Plate from lactose medium further studied, with positive result, when direct culture found positive. Non-lactose-fermenting colonies from mannite medium not tested further.

Salm. paratyphi A isolated was aerogenic, but MacC-M, though acid, contained no gas ; further tests on the plate from it might therefore have revealed *Salm. typhi*. The lactose medium, however, was also acid (without gas) and it is possible that both media were in fact mannite, one having been labelled lactose in error (see also note (*c*)). Otherwise, acidity of the urine specimen may have caused the effect in the lactose medium, and also have led to the failure of the oxalate method by lethal action during prolonged contact.

(*b*) Case II : MacC-L remained neutral, and MacC-M was acid. The former was positive on subculture to D.C.A., the latter on subculture to both MacConkey and D.C.A. This was the primary isolation from chronic carrier No. 4 (*q.v.* under Part III and Table II).

(*c*) Case III : Neither of the MacConkey media was acid after 48 hours [possibly a container of lactose medium was marked mannite in error (see note (*a*)) or this too may perhaps have been an inoculum effect, in this case strong buffering action of the urine]. This was the primary isolation from chronic carrier No. 2 (*q.v.* under Part III and Table II).

(*d*) Direct cultures from cases II, III, VI and VIII were contaminated.

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Table 1—*continued*

Series	No. of Persons Tested (by culture of a pool of 3 specimens)	Method (D=simple direct plating. O=oxalate precipitation)	No. of positive cultures	Isolations T=*Salm. typhi* isolated A=*Salm. paratyphi A* isolated C=*Salm. paratyphi C* isolated — Pathogens isolated	Comment	Case Nos.	Note reference
C	166	D	2	A	From two cases	IV, V	
		MacC-L	2	A	From cases IV and V	IV, V	(*e*)
		MacC-M	3	A	From cases IV and V	IV, V	(*e*)
				T	From a further case	VI	(*f*), (*d*)
D	508	D	1	A	From one case	VII	
		MacC-M	4	A	From case VII and another	VII, VIII	(*g*), (*d*)
				C	From one case	IX	(*k*)
				?T	From one case	X	(*l*)
E	534	D	5	T	From four cases	XI, XII, XIII, XIV	(*m*)
				A	From one case	XV	(*n*)
		O	2	T	From cases XII and XIII	XII, XIII	(*m*)
F	682	D	8	A	From one case	XVI	
				T	From four cases	XVII, XVIII, XIX, XX	
				C	From two cases	XXI, XXII	
				?A	From one case	XXIII	(*p*)
		MacC-M	11	A	From cases XVI and XXIII and three others	XVI, XXIII, XXIV, XXV, XXVI	(*q*)
				T	From cases XVII and XVIII and one other	XVII, XVIII, XXVII	(*r*)
				?T	From case XIX	XIX	(*s*)
				C	From cases XXI and XXII	XXI, XXII	(*t*)

(*e*) Case IV: Acid and gas in *both* MacConkey media. *Salm. paratyphi A* (poorly aerogenic) from MacConkey plate from both. Colonies on D.C.A. were minute and not further examined. Case V: MacC-L no change. MacC-M acid and gas.

(*f*) MacC-L no change and no record of subculture, MacC-M acid. *Salm. typhi* from subcultures on both MacConkey and D.C.A. plates.

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(*g*) Case VII : MacC-M acid and gas but poor growth on D.C.A. (only three colonies), missed until direct culture positive. No subculture to MacConkey plates. Case VIII : MacC-M acid and gas.

(*k*) MacC-M acid and gas : no gas in glucose (slight gas in mannite) inoculated from one colony ; no gas in mannite or dulcite (but slight gas in glucose) inoculated from another colony.

(*l*) MacC-M acid only. Colonies from D.C.A. produced acid only in glucose and mannite : growth rough. No record of serological tests.

(*m*) Case XI : Oxalate culture apparently omitted. Case XII : Investigated by both pool and individual cultures of three specimens. All four were found positive by oxalate precipitation, but one separate specimen was negative on direct plating. Case XIV : Plate from oxalate accidentally broken.

(*n*) Case XV : Negative by oxalate method.

(*p*) Non-lactose fermenting colonies ; not further tested.

(*q*) MacC-M showed acid and gas in cases XVI, XXIII and XXV. Acid only in case XXVI and alkali in case XXIV.

(*r*) MacC-M showed acid in case XVIII, but was neutral in case XXVII and weakly alkaline in case XVII. Case XX gave an acid culture in MacC-M but *lactose fermenters only* on subculture.

(*s*) MacC-M acid, no further record.

(*t*) MacC-M acid only from case XXI, *neutral* with *gas* from case XXII.

SUMMARY :	Persons examined	2,083	
	Enteric group strains isolated ...	27	(1.3 per cent. examined were thus excretors).
	Proportion missed by—		
	Direct culture	10/27	T 5/14, A 4/11 and one doubtful, C 1/3. Both A and T isolated from double carrier. See also note (*m*).
	Oxalate	3/6	T 2/5, A 2/2. Both A and T missed from double carrier. (This failure therefore shown under each species). But see note (*m*).
	Fluid MacConkey	1/22	T 1/9 ; one other T doubtful ; T missed in double carrier ; in one of the other ten specimens from A excretors the organism was scanty and missed until *direct* examination was found positive.

Specimens from 192 cases were cultured in MacC-M only. Four yielded cultures of *Salm. paratyphi A* and four cultures of *Salm. paratyphi C*, bringing the incidence to 35 excretors among 2,275 persons (1.5 per cent.).

Fermentation by the former was indicated by acid twice ; the two other cultures were alkaline. Slight gas was present in three, more abundant gas in the fourth (an acid culture). *Salm. paratyphi C* produced acid in three of four cultures (two being only slightly acid) ; the fourth culture was neutral but contained gas. Gas was absent from one of the weakly acid cultures.

PART II.—INVESTIGATION FOLLOWING AN OUTBREAK

Eighteen foodhandlers were involved. The specimens came from a distance. A first examination was made on triple pools by direct, oxalate and fluid MacConkey cultures. One case was apparently positive by all methods. The MacConkey media used for this case both showed gas. The lactose was alkaline, but the mannite acid. Non-lactose fermenters grew from the latter on both

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D.C.A. and MacConkey plates. The strain was too rough to identify, but later isolations from the same carrier, though also rough, were established as *Salm. paratyphi C* (strain 6 of the sixth paper of this series). It chanced that this individual was one from whom single specimens were also examined separately. Direct and oxalate cultures were used for these separate examinations. Two of the three were positive by the former and only one of the three by the latter. The next two examinations were on incomplete batches of specimens cultured by direct and MacConkey methods only. In one the *Salm. paratyphi C* carrier was missed, his specimen being omitted from the other. Seven further batches of specimens were cultured singly, not pooled, by direct and MacConkey methods (MacC-M only, on the last three occasions). The *Salm. paratyphi C* carrier was missed *four of seven times by direct culture*, and *one of seven times by MacConkey*. With regard to the latter, the lactose medium showed gas, gas with alkali, and no change on the three occasions when it was used in positive tests ; the mannite medium showed acid and gas in all such tests. D.C.A. plate-subcultures were positive on five of the six occasions. Subcultures to MacConkey were positive on the only two occasions when it was used (which included the one on which D.C.A. was negative, showing fermenting colonies only). On one occasion only, an organism provisionally identified as *Salm. paratyphi A* was isolated in MacC-M (but not on direct culture) from a different person in the group. The MacC-M contained acid and gas ; MacC-L was unchanged and the strain was agglutinated by *A* "O" (but not *A* "H") serum.

Part III.—Follow-up Cultures on Known Carriers

1. *In an Investigation of Regularity and Weight of Excretion* (Archer *et al.*, 1952)

The results obtained by the use of direct plating, selenite and MacC-M in the follow-up of nine of the ten carriers classified as chronic in the second paper in this series are recorded in Table II, which shows a higher proportion of positive cultures from direct plates than from either of the fluid media.

This can partly, but not entirely, be accounted for by the failure of both fluid media in the majority of tests carried out on carrier No. 2, though direct inoculation of plates from the same specimen was successful. Archer, Goffe and Ritchie (1952) considered this apparent self-sterilization as possibly due to phage action. Later observations on the acid tolerance of carrier strains and the acidity produced by fermentation (Archer, 1953) suggest that a heavy inoculum of acid urine was, perhaps, a more likely cause. This, however, would hardly explain a peculiar abrupt termination of growth from serial dilutions in a viable count (when the number of colonies present on the last positive plate led to an expectation of at least one further dilution showing some), a finding which was also recorded as twice observed by them among five attempts to carry out viable counts on specimens from this person. The tabulated results for successful isolations are very probably too small since positive findings may have been reduced by failures of serological identifications due to antigenic degradation. This is suggested by failures of this kind sometimes occurring with cultures isolated only by one or two of the methods used, the remaining culture (or

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TABLE II.—COMPARATIVE RESULTS IN FOLLOW-UP CULTURES OF URINE OF CHRONIC CARRIERS BY DIFFERENT METHODS

Carrier's No.	1	2	4	5	9	10 (*a*)	19	20	21	Totals		
Specimens isolated (T=*Salm. typhi* A=*Salm. paratyphi A*)	T	T	T	A	A	T	A	T	A	All T's	All A's	A's and T's
Direct Culture :												
Number positive ...	32	17	19	20	26	20	28	30	18	118	92	210 (*b*)
Number examined ...	37	27	22	23	35	27	30	30	18	143	106	249
Percentage positive	86	63	86	87	74	74	93	100	100	82.5	86.8	84.3
Selenite :												
Number positive ...	12	5	17 (*c*)	10	17	18	11 (*d*)	22	6	74	44	118
Number examined ...	21	26	21	17	22	26	11	22	6	116	56	172
Percentage positive (when more than 10 tests)	57	19	81	58	77	69	100	100		63.8	78.6	68.6 (*e*)
MacConkey mannite :												
Number positive ...	16	8	15	13	14	16	4			55	31	86
Number examined ...	23	25	20	17	22	23	4			91	43	134
Percentage positive (when more than 10 tests)	70	32	75	76	64	70				60.4	72.1	64.2 (*f*)
Results by any method : (*g*)												
Number positive ...	33	18	25	23	34	25	30	30	18	131	105	236
Number examined ...	39	29	26	25	37	29	30	30	18	153	110	263
Percentage positive	85	62	96	92	91	86	100	100	100	85.6	95.5	89.7

NOTES ON TABLE II

(*a*) Results shown are those following the first course of unsuccessful treatment recorded by Archer and Naylor (1952).

(*b*) Direct examinations were more frequent than those using either fluid medium. A reduced series, however, consisting of cultures of specimens for which one or both of the additional methods were also used, yielded 82 per cent. (141/172) positive and "presumed positive" cultures.

In this series a "presumption of identity" of the organisms present with those identified in the other medium has been made twelve times when serological tests on the plate culture failed (see text), or when identification is not recorded. If these results are regarded as negative, or omitted from the series, the positive findings fall to 75 per cent. (129/172) or 80.6 per cent. (129/160) respectively.

(*c*) In four other tests (three positive and one negative) tetrathionate was used in place of selenite.

(*d*) First isolation was in selenite, the direct plate being negative.

(*e*) This percentage rises to 77 positive (137/178) if certain doubtful, and a few later, results are included.

(*f*) Rising to 75.4 per cent. positive (104/138) if certain doubtful results are included.

(*g*) The figures here are, in the main, smaller than the corresponding ones in the second paper in this series. Most of the examinations here listed, however, formed part of the larger numbers then reported. Even so, sometimes only one or two methods, not all three, were used for this reduced series, and the figures for the positive results by all methods are therefore probably lower than they would have been had all three been used on each occasion.

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TABLE III.—SUCCESS OF DIFFERENT CULTURE METHODS IN CASES UNDER TREATMENT

Case No. (Pathogens carried)	Nature and stage of treatment	Isolation of Pathogens					
		Direct culture		Selenite		MacConkey mannite	
		+	−	+	−	+	−
9 (*Salm. paratyphi A*)	*Preliminary cultures and cultures between courses	33 (*a*)	1 (*b*)	10 (*b*)	8 (*c*)	31 (*d*)	1
	For 3 days after Hexamine ...	2 (*e*)	1	1 (*e*)	2	1 (*e*)	2
	Sulphanilamide Course ...	0	4	4 (*f*)	0	4 (*g*)	0
	For 7 days after Sulphanilamide	2	5	2 (*h*)	5 (*h*)	5 (*k*)	2
	For 3 days after Streptomycin	1	2	3 (*m*)	0	2	1
10 (*Salm. typhi*—second series of courses)	*Preliminary cultures and cultures between courses	75	5	53	7	73 (*n*)	5 (*p*)
	Hexamine Course	8 (*q*)	2	6 (*r*)	2	8 (*s*)	2
	Sulphanilamide Course ...	1	6	6	1 (*t*)	6 (*v*)	1 (*t*)
	Streptomycin Course ...	1 (*w*)	5	1 (*x*)	5 (*x*)	2 (*y*)	4 (*y*)
20 (*Salm. typhi*)	Preliminary Cultures ...	12				11 (*z*)	1
Totals (percentage by each method)		135 (81.3)	31 (18.7)	86 (74.1)	30 (25.9)	143 (88.3)	19 (11.7)

* The results of all cultures between courses are not here recorded, but the numbers given for each method refer to cultures made between the same dates, from portions of the same specimens.

NOTES ON TABLE III

(*a*) After sulphanilamide course plates sometimes showed only a few colonies, but acid and gas were regularly present in MacConkey-mannite.

(*b*) The ten positive selenites include the specimen negative by direct plate. Three of the ten were negative in 6-hour subcultures though positive after 18 hours; seven were positive after 6 hours.

(*c*) These were tested at 6 hours *only*, not after 18 hours.

(*d*) Presumptive.

(*e*) One colony and three colonies only on respective direct plates; the former was also positive in the fluid media, but there was no acid or gas in MacC-M, and only the 18-hour subcultures were positive from selenite.

(*f*) After 18 hours; negative on 6-hour subculture.

(*g*) One showed no acid or gas in MacC-M, another showed gas only.

(*h*) Two positives at 18 hours only (both negative at 6 hours). One was direct negative but also MacC-M positive. Two of the five negatives were only tested after 6 hours, not after 18.

(*k*) Two (both negative by direct test) showed only poor fermentation (one slight acid and gas, the other slight gas only). The three other positives were presumptive.

(*m*) At 18 hours, negative at 6 hours.

(*n*) The positives include the five which were negative by direct test; 66 others were presumptive.

(*p*) Four contaminated.

(*q*) One to eight colonies only on each plate.

(*r*) Includes one negative by direct plating.

(*s*) One was from the other specimen negative by direct plating. The other seven were presumptive.

(*t*) Same specimen; contaminated in MacC-M.

(*v*) Two showed no acidification of MacC-M.

(*w*) One colony only.

(*x*) The specimen producing the positive culture was negative by direct plating, and one of the five negatives was positive by direct plating.

(*y*) The specimens producing the positives were both negative by direct plating, one was positive in selenite. The four negatives included the direct positive.

(*z*) Presumptive.

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cultures) being identifiable. Where this occurred an assumption of identity has commonly been made for all, but when all isolations from a specimen were inagglutinable a negative result was recorded. Later, biochemical tests were mainly used, and the presumptive evidence afforded by them accepted, serological confirmation of identity being only occasionally sought.

These three methods were also used to examine specimens from carriers 13, 14, 17 and 18 (Archer *et al.*, 1952). Direct culture was positive 29 times in 33, selenite 19 times in 31, MacC-M 21 times in 30. All 33 specimens were positive by one or more methods. Here again the comparative failure of the fluid methods for carrier 18 (direct 12/12, selenite 6/12, MacConkey 6/11) largely accounts for the observed differences in effectiveness.

2. *In Control of Treatment reported by Archer and Naylor* (1952)

The same three methods were used for the culture of specimens before, during and after treatment of cases. Selenite was frequently subcultured twice—after 6, and again after 18, hours. When direct cultures were positive, biochemical and serological identification tests were generally confined to them, and positive results with other media were "presumptive" only ; when direct cultures were negative, however, identity was established by similar tests on organisms isolated by the fluid methods. Results are given in Table III.

They show again the high value of direct culture, though here even better results attended the use of MacConkey-mannite, probably largely due to the relative success of the latter when the number of pathogens was low. Comparatively poor results with selenite are due to the number of negative results when subculture was made after 6 hours only. An inhibitory concentration of the excreted drug may have caused direct cultures of some specimens to be negative, while inoculation into a fluid medium diluted the drug content of the same specimen below an effective level so that growth occurred. (*Para*-aminobenzoic acid was, however, used in plates inoculated during sulphanilamide treatment.) It will be seen from notes (*g*), (*k*) and (*v*) to Table III that fermentation in MacConkey-mannite was sometimes not evident though the organism was present. Such findings will be discussed in general in a further paper, but in these instances they may have been due to a carry over in the inoculum of semi-inhibitory drug concentrations.

The suitability of 18 hours in selenite and its superiority to 6 hours is confirmed by notes (*b*), (*f*), (*h*) and (*m*) to Table III, though for most specimens the latter period is quite satisfactory.

Analysis of small numbers shows little difference in success of subculture to MacConkey or D.C.A. plates from either MacConkey-mannite or selenite.

Part IV.—Discussion, Summary and Conclusion

Discussion

Before attempting to make recommendations regarding the best practicable methods of routine screening by urine culture to exclude enteric carriers, an attempt must be made to account for Table I's showing fluid MacConkey to be

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considerably better than direct culture, while Table II shows the reverse. Two possibilities suggest themselves : the type of carrier concerned, and the type of specimen.

The Type of Carrier Concerned.—Table I records the results of routine screening ; the carriers are unselected and may be presumed to include a proportion who are transient or intermittent. The larger inocula possible when using fluid media were presumably responsible for the success of 13/24 cultures in selenite or tetrathionate, as compared with 8/24 positive direct plates, from the intermittent carrier No. 12 recorded in the second paper in this series. Intermittent carrier No. 14 showed five cultures positive in MacC-M as compared with four positive by direct plating, and the results in Table III also suggest the superiority of MacC-M when pathogens are scanty (due to treatment in the results there recorded, but as may occur from time to time even in chronic carriers (Archer *et. al.*, 1952)). The passage of the pathogens in small numbers may also have caused the relatively poor results of direct culture of specimens from the *Salm. paratyphi C* carrier recorded in Part II above, though contamination was also present.

All carriers listed in Table II, on the other hand, were chronic persistent.

Nevertheless the possible occurrence of transient or intermittent carriers in the series analysed in Table I does not wholly explain the discrepancy, since two of the carriers missed by direct examination in routine screening were chronic carriers No. 2 and No. 4 (*vide* notes (*b*) and (*c*) to Table I), and the frequency with which direct cultures from them were positive (*vide* Table II) shows that the chance against this occurring is approximately 19 to 1. Carrier No. 19 was also missed by direct culture (*vide* note (*d*) to Table II) and the chance against this should have been 14 to 1, while the chance against all three being negative by direct culture (as they were) would be 296 to 1, *if in all cases cultures were similar.*

The Type of Specimen.—Cultures for routine screening (Table I) and for carrier follow-up (Table II) were not similar, however, but differed in the nature of the inoculum, that for routine screening being a pool of three specimens taken on consecutive days, that for follow-up, a fresh specimen passed that day. Though three specimens were taken and used by the former method, a negative result on direct culture occurred three times (33 per cent.) in the primary (screening) tests on the nine cases listed in Table II. The over-all chance of a single specimen being negative by direct plating in the examinations there recorded, however, is only 15.7 per cent. and that of two direct plates both, and that of three direct plates all, being negative 2.5 and 0.4 per cent. respectively. Similarly, while the screening plates of carriers No. 2 and No. 19 actually were negative, the chance of the former (the least frequently positive of the chronic carriers) being so by all of one, two or three direct plates was 37, 13.3 and 5.1 per cent. and of the latter being similarly negative 6.7, 0.4 and 0.03 per cent. respectively.

It thus appears that the method of specimen pooling used for screening was not good ; that, although three samples were taken, better direct plating results

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might have been achieved by the immediate culture of a single one from each case, and would almost certainly have followed the separate culture of two ; and that it was this difference of inoculum which accounted for the discrepancies found between the relative efficiency of direct plating and MacC-M in the two series of tests recorded in Tables I and II respectively. The manner in which pooling might diminish the chances of positive culture may include :

(1) The possibility of contaminants over-growing the pathogen in the first and second specimens while waiting for the third ; as stated in note (*d*) to Table I, four of the ten direct negatives were recorded as contaminated. This chance may be diminished in fluid culture by pooling in the medium, rather than pooling before inoculation—adding to the medium a portion of each specimen when passed, and refrigerating (rather than incubating) until the last portion is added.

(2) The possibility of over-dilution of one (or two) specimens containing a few pathogens by additions of two (or one) containing none. When dealing with chronic persistent carriers this seems only likely to arise if there is—

(3) Killing of the pathogens in the first and second specimens by acid (or some other factor) in one or both of them, while the third is awaited. Such a possibility is suggested by the observed occurrence of rapid death in media, on the supposition that death of the culture is then due to the lethal action continuing in a large urine inoculum. Large inocula of this type may also have accounted in whole or in part for the inferiority of MacC-M and selenite to direct plating shown in Table II, the adverse effect being perhaps enhanced by acid products of fermentation in the former. The poor results of oxalate precipitation recorded in Table I may have had a similar cause. This supposition and the absence of visual evidence of "sugar" fermentation sometimes noted in MacC-M will be considered in the next paper in this series.

(4) Development of bacterial antagonism in specimens awaiting culture.

Recent Results.—While separate specimens are thus probably the inocula of choice for direct plating, recent results since the use of two such inocula was adopted (Nagington, 1953) do not, unfortunately, show that degree of improvement that the above calculations might suggest. Direct plating remained inferior to selenite, which was used in parallel with it for local specimens. (The use of MacC-M was now confined to specimens obtained at a distance and sent in it to the laboratory.)

Thus Nagington obtained positive culture in selenite from 31 of 32 excretors in 1952, while only 25 of the 32 yielded positive direct plates, a direct/selenite ratio of 80.6 per cent. If, however, this is compared with the direct/MacC-M ratio for those series in Table I (B, C, D and F) where both were used, which was 12/21 (57.1 per cent.), some improvement in direct plating results would seem to have resulted from the change of method. Such a deduction calls for an assumption that the selenite used in the 1952 series was as efficient as the MacC-M in the earlier one. This seems more than justified by results shown in Table II, but of doubtful validity on considering those in Table III, where treatment had, in some

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instances, apparently given rise to inocula containing scanty organisms. Moreover, if irregular, doubtful, or retrospectively positive results in MacC-M (notes (*a*), (*c*), (*g*), (*l*), (*r*) and (*s*) to Table I) are left out, the direct MacC-M ratio for Table I becomes 12/15 (80 per cent.).

Numbers Excreted.—When comparing these recent results with those in Table II it must be emphasized that the former, as with those in Table I, may be presumed to include positive isolations from transient or intermittent carriers. Those missed in the recent series by either method were the only excretor of *Salm. paratyphi B*, which was negative by selenite ; and five excretors of *Salm. paratyphi A*, one of *Salm. typhi* and one of *Salm. paratyphi C* missed by direct plating. The proportion of *Salm. paratyphi A* to *Salm. typhi* direct-plating failures was thus 5/1, while the ratio of positive isolations of these species in selenite was less than 2/1. This might be due to a general greater likelihood of missing *Salm. paratyphi A* than *Salm. typhi* by direct plating, or to the incidence in this series of a higher proportion of excretors of scanty organisms of the former than of the latter species. To assess the first of these possibilities the numbers of organisms found by viable counts on specimens passed by chronic carriers of each may be compared. Of the 38 successful viable counts recorded by Archer *et al.* (1952), 21 were on six chronic carriers of *Salm. typhi*, 12 were on four chronic carriers of *Salm. paratyphi A*, and 4 on an intermittent and two unclassified excretors of the latter species. Sixteen of the *Salm. typhi* counts (from four carriers) were over a million per ml. and, though nine of the sixteen were from one person, the average of the mean counts on each of the six was five million per ml.

On the other hand, only two of the counts (from different carriers) on the chronic carriers, and one of the counts on an unclassified carrier, of *Salm. paratyphi A* were over a million. The average of mean counts on the chronic carriers was 440,000 ; on the others, one million ; and on all *Salm. paratyphi A* excretors, 650,000. These figures, however, cannot be correlated with a higher failure rate of direct culture for the latter than for the former species, since all these specimens submitted to viable counts save two should, on the evidence of the counts, have produced considerable growth, while the remaining two should not have been missed, on plating a loopful of urine. Further, though wide fluctuation is also shown by a colony record of 8, 1, 1, 3, 14 and "scanty" colonies from loop-inocula from four of the chronic carriers of *Salm. typhi*, and 2, "scanty" and "scanty" from three of the *Salm. paratyphi A* excretors, carriers No. 1 and No. 19, who had the two lowest average viable counts (21,500 *Salm. typhi*—average of two counts, and 29,000 *Salm. paratyphi A*—average of five counts, respectively) were, as will be seen from Table II, generally positive by direct plating. Table II also shows a slightly higher proportion of positive results of direct plating from the four chronic carriers of *Salm. paratyphi A* than from the five of *Salm. typhi*. The observed difference in viable counts may well be due to chance. If confirmed as significant in a larger series it might afford a possible explanation of the apparently greater existing risk of infection with *Salm. typhi* than with *Salm. paratyphi A*, but Chadwick (1952) found carriers of

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both species to be infective, "there being slight and possibly unimportant differences in the behaviour of the two species."

Volume of Plating Inoculum.—In view of the above, and since direct-culture failures shown in Table I are evenly distributed between species, it seems likely that the recent high failure rate of *Salm. paratyphi A* may reflect the incidence at that time of habitual excretors of few organisms. Habitual scanty excretion by chronic persistent carriers is uncommon. Hence the excretors missed by direct plating in 1952 may have been non-persistent. The fact that, in respect of six of them, only one of the two specimens cultured in selenite from each was positive, gives a little support to this idea. Transient or intermittent carriers would be liable to be missed by any method, and should be less dangerous if employed, but in the absence of direct evidence that these only were, or are likely to be, missed by direct plating, and in an endeavour to increase the probability of finding excretors of relatively scanty organisms of all types by this method, it seems desirable to try the use of larger inocula. The possibility of thus favouring overgrowth of the enteric species by other organisms also present must not be overlooked, but, as will be shown in a further paper, this is unlikely to be great if fresh specimens are used. Larger inocula could be obtained by the use of drops from a pasteur pipette which could then be spread more widely over the plate (Vogelsang and Boe, 1948), by the use of a swab dipped in the specimen and rubbed over the plate, by preparing pour-plates as used by Archer *et al.* (1950), or by the use of centrifuged specimens. The last two, of course, add to the work involved and the equipment required and hence should be avoided if possible. Use of pour-plates was soon stopped as being unnecessary for carriers' follow-up. Centrifuging may be possible without a great increase of work if a suitable centrifuge, in which a large number of specimens may be rapidly spun down in the containers in which they were collected, is available. It is hardly practicable on the scale required, however, in simple laboratory centrifuges, and the use of precipitation was investigated by Archer and Ritchie (1950) as a practical substitute.

Oxalate Precipitation Method.—Oxalate precipitation was subsequently advocated as almost the method of choice. It proved somewhat laborious in routine practice, however, particularly the removal of the supernatent fluids from the large number of specimens involved. This entailed the attachment to a suction pump and reservoir of a fresh sterile pasteur pipette for each specimen. Further, as noted above and in Table I, results were disappointing. It was therefore discontinued.

Summary and Conclusions

1. The results of direct plating, and of plating after oxalate precipitation and after culture in MacConkey-mannite, in routine carrier clearance tests are tabulated, described and discussed. More recent results, using direct plating and plating after culture in selenite medium, are also considered.

The relative failure shown by direct plating is suggested as partly due, in the earlier series, to the use of pooled specimens, since it is at variance with its

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success when using fresh single specimens in carrier follow-up. An additional cause in that series, and one also affecting the more recent results, however, seems to lie in specimens containing scanty pathogens. Such specimens are considered as more likely to be commonly passed by transient or intermittent, than by chronic persistent, carriers.

2. Recently *Salm. paratyphi A* has been, both relatively and absolutely, more frequently missed by direct plating than was *Salm. typhi*. Chronic carriers of *Salm. typhi* would appear, on the limited evidence available, to be more liable to pass organisms in very large numbers than carriers of *Salm. paratyphi A*, the average viable counts for the two species in a small series being about eight times greater for the former. There is no correlation, however, between these sets of findings.

3. Results of direct plating and of preliminary culture in selenite medium or MacConkey-mannite medium in the follow-up of chronic carriers are similarly considered.

4. It is thought that—

(i) Direct plating of two fresh specimens on different days should give better results than the pooling of three specimens before culture. When specimens can reach the laboratory fresh it is the single method of choice.

(ii) Culture of a third specimen gives, of course, an even better chance of success, but an improvement in detection of chronic persistent carriers of 2 to 10 per cent. is all that can be expected from it. As some Egyptian carriers may be transient or intermittent and, as such, be missed by any feasible screening plan, complete elimination of all carriers among these people is not practicable. Such a gain is therefore not commensurate with the 50 per cent. increased work involved, when working in Egypt, if facilities are limited.

(iii) The use of a single culture method is the ideal, since each additional method is liable to cause 50 to 200 per cent. extra work for a relatively small gain. If a single method is to be relied upon, however, it should achieve 90 per cent. of the success to be gained by the combined use of any two. Its more frequent use, rather than the rarer use of multiple methods, then seems fully justified. Such a degree of success has not yet attended the use of direct plating in routine screening. It has been found in 1952 for selenite, but the high proportion of failures of cultures containing large fluid inocula from certain carriers, and the lower general success of fluid culture from chronic persistent carriers studied, renders the sole use of such culture methods inadvisable, until the causes of such failure, and means to overcome them, are known.

(iv) Thus the examination of two fresh specimens both by direct plating and by plating after primary fluid culture seems indicated pending trial of larger inocula for the former, which might so improve results as to warrant its use alone.

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I am indebted to my colleagues at the Central Laboratory, Fayid, for much of the work here recorded, especially Doctors (then Majors) A. P. Goffe and

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G. R. E. Naylor, and Captain J. Nagington. I am also greatly obliged to Captain Nagington for detailed information on the work done since I left the Laboratory early in 1952. I wish also to thank the Director of Pathology, Brigadier A. Sachs, *C.B.E.*, M.D., M.Sc., Q.H.P., for permission to publish this work.

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CORRIGENDUM

The following correction should be made in the fifth paper in this series entitled "Cultural Abnormality and Variation in Isolated Strains." (This Journal, Vol. 99, pp. 55-65.)

Page 60*:* Under "*Least acid reaction at which a culture died*," second line, before "(*Salm. paratyphi C* in glucose)," for "*p*H 4.63" substitute "*p*H 4.80."

THE LATE DR. MERVYN GORDON

Dr. Mervyn Gordon, *C.M.G.*, *C.B.E.*, D.M., F.R.S., who died on 26th July, 1953, at the age of 81, had been a member of the Army Pathology Advisory Committee since its inception in 1919, and in these thirty-four years he attended every one of the seventy meetings of the Committee. Dr. Gordon had previously been, from 1915 to 1919, a Consulting Bacteriologist to the Army, with the honorary rank of Lieutenant-Colonel.

The Army Medical Services, in mourning an able and stimulating adviser, honour a record of loyal and devoted service which will not readily be equalled.

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A SURVEY OF SERVICE PSYCHIATRY IN THE FAR EAST IN 1951

BY

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(*Continued from Vol.* 99, *No.* 4, *p.* 180)

SECTION III

Families here probably come within the sphere of the psychiatrist much quicker than at home. In fact there is no doubt that quite a number of these cases would have been dealt with at the old general practitioner level. Such a practitioner, a trusted friend and father confessor, would listen to their tale of woe and then give his reassurance, help and advice, and probably prevent an adventure into mental illness. If the Regimental Medical Officer is taken as the counterpart of the general practitioner, then the picture is entirely different. The R.M.O. is usually young and recently qualified. Postings and transfers are frequent, and therefore he is seldom long enough there to become part and parcel of the unit. Families often feel that because of his youth he has not yet had the opportunity of facing the various problems of life, and that therefore with his lack of experience he will not be able to understand or assist them with their personal worries. They are also inclined to feel rather embarrassed to tell the intimate details of their family problems to one so young.

Superficially at least, domestic disharmony would appear to be very common among service personnel serving in this theatre. The main reason for this is probably that dirty linen has to be washed in public. At home the shaky marriage may be held together by advice or support from one or other of the parents, and, of course, psychiatric advice can always be obtained from a civilian source. If the husband and wife have too much of each other, then they can separate at least temporarily, and perhaps live with their parents for a short period. Out here there is no such privacy—a personal domestic squall is raised almost to the level of a unit problem. Another important factor is, of course, the fact that there is no stigma in having been treated by a psychiatrist in this part of the world. In fact it is fashionable—it is the done thing—the mental breakdown is easily attributed to the "terrible climate." Admittedly, when one comes to the tropics from a more temperate zone, it is a new environment and does test our ability to adjust under a certain amount of stress and strain. But there is still too much the idea that the tropics is the white woman's grave. The newcomer,

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even before she leaves the United Kingdom, is given a long list, by her friends, of the various tropical diseases, both physical and mental, which are hiding round the corner ; vivid imagination produces a few more. In fact, the official pamphlet's only effect is to produce a fear or almost a true phobia about one's poor health. Individuals, and especially the female sex, become completely hypochondriacal. In time it is hoped that just as the spine pad and the topee have quietly disappeared, so too will this over-emphasis on mental ill-health follow suit. Perhaps by then the term "tropical fatigue" will be realized to be an excuse for laziness.

During the year 1951, 102 patients were treated, 82 wives and 20 children. The Army accounted for 54 of the wives, the R.A.F. 21, and the Royal Navy only 7. Again, 51 of the patients were officers' wives, and 31 wives of other ranks. It is difficult to determine the exact proportion of army wives in this theatre to those of the other services. It is certain that army wives are in the majority, but it is doubtful if the proportion is over 7 : 1 as for navy wives. As there are more other ranks' wives than officers' wives in this theatre, it would at first appear to be rather surprising to note that many more officers' than other rank wives attend as patients. The reason for this will probably be more easily determined when discussing the various causative factors producing the psychiatric disability.

The main presenting symptoms given at first visits were as follows :

(*a*) Domestic disharmony	26 cases
(*b*) Headache	8 ,,
(*c*) Chronic worry and anxiety	8 ,,
(*d*) Sexual disharmony	7 ,,
(*e*) Excessive alcoholic consumption	5 ,,
(*f*) Delusions	5 ,,
(*g*) Depression	4 ,,
(*h*) Neurodermatological	4 ,,
(*i*) Mental instability following pregnancy	4 ,,
(*j*) Fear of suicide	2 ,,
(*k*) Fear of the dark	2 ,,
(*l*) Feeling of shyness or introversion	2 ,,
(*m*) Paresis	1 ,,
(*n*) Fear of insects	1 ,,
(*o*) Inability to swallow	1 ,,
(*p*) Aphasia	1 ,,
(*q*) Fear of pregnancy	1 ,,

The patients themselves sometimes realized that their symptom was only a cover for a more intimate problem, which they were perhaps only able to discuss at a later interview. In fact, the presenting symptoms at the initial interview were usually of very little importance from the psychiatric angle and were more or less ignored. The reason why rather a large number appear to report with domestic disharmony as a symptom is that they had first reported to the Medical Officer with other symptoms, and the M.O. had considered that there was

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domestic disharmony with a possible psychogenic causative factor. The psychiatrist thus often finds himself being utilized as a marriage advice counsellor. It is interesting to note that not one single patient complained about her inability to withstand this tropical climate.

The constitutional ætiological precipitants of psychiatric breakdown have been discussed in Section II, and are much the same for both the sexes. But the environmental factors at play in symptom production in the families group are frequently so very different from those seen in the male, that a separate analysis is warranted. This can perhaps best be done by listing the varied precipitants, roughly in order of frequency :

(i) Frequent separations from husband and worry over husband fighting in jungle or guerilla warfare.
(ii) Financial worries—usually in people who want to take advantage of the social amenities in this tropical clime, but who are in too low a pay bracket.
(iii) Inability to accept the culture and climate of this part of the world.
(iv) Too much leisure—usually officers' wives with two or three servants and too little to occupy their interests or attention.
(v) Dislike of hotel or boarding-house life.
(vi) Intermarital disharmony, and frank marital infidelity.
(vii) Excessive alcoholic indulgence in one or both parties.
(viii) Menopausal, pregnancy or puerperal features or fear of pregnancy.
(ix) Jealousy over a grown-up daughter or step-daughter.
(x) Inability to adjust to a tropical way of life due to personality, inadequacy or low intelligence.

An analysis of the diagnoses in these 82 female patients shows that 6 were suffering from some form of psychosis, 15 from a severe form of psychoneurosis, at times amounting to almost psychotic intensity, and 56 were diagnosed as mildly psychoneurotic. In 5 cases no true psychoneurosis existed. Gross domestic disharmony was present in 20 cases, but was found to be a factor in milder form in roughly half the patients seen. By gross disharmony we mean those cases where either partner wishes to leave the other, either by separation or divorce. Gross sexual disharmony was found in 12 cases, mainly due to nymphomania or sexual aberrations on the part of the husband. Minor sexual problems were encountered much more frequently and included cases of the continued practice of *coitus interruptus* and various grades of frigidity.

Over 50 per cent. of the cases seen were treated as in-patients, and this rather high proportion is partially explained by the fact that a number of these patients live at some distance from the psychiatric block (sometimes two to three days' travel) and thus even if intensive out-patient treatment alone is considered necessary, admission to hospital is the only means of carrying this out. In-patient treatment of female patients, although not ideal, is fairly satisfactory. Psychoneurotics are generally admitted to the ordinary families' ward. Psychotics or cases for observation are admitted to a special small ward. This small ward

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adjoins the male psychiatric ward and consists of a self-contained two-bed ward with sitting-room and annexe. Burglar-proof wire netting ensures safety precautions, without giving the effect of a barred ward. When a patient is admitted to this ward, three Q.A.R.A.N.C. Nursing Sisters are made available by the Matron for duty. At least one Sister and, if possible, all three have had previous psychiatric training. In order to economize in staff as much as possible, the patient, if not considered to be a definite suicide risk, is transferred to this ward only during the hours of treatment, and remains in the ordinary families' ward for the remainder of the day and night. For example, such a patient having insulin treatment will only remain in this ward from 0700 to 1200 hours, thus requiring only one nursing Sister shift.

Psychotherapy was, of course, the main treatment; in about half the cases seen this was supplemented by at least one drug abreaction, either pentothal, ether or carbon dioxide (the latter mainly experimentally and never with very great success). Other forms of therapy employed included electroplexy, modified insulin, various forms of sedation, vitamin B and hormone therapy, marriage counselling, convalescence in a hill station, and invaliding to the United Kingdom. This latter procedure judiciously used can be a most powerful therapeutic weapon in service psychiatry in an overseas station. E.C.T. was employed mainly in the psychotic group, and two cases of puerperal psychosis so treated made uninterrupted and swift recovery. Hormones were of value, especially in the neurodermatoses. One dermatological case which had been treated by various physicians and dermatologists, service and civilian, both at home and abroad for the past thirteen years, cleared up completely after two short courses of ethisterone given prior to two consecutive menstrual periods. Marriage counselling was a therapeutic agent of real value in those cases where marital discord was due more to ignorance of marriage relationships than to incompatibility.

Twenty children were seen during the year, mainly at the out-patient clinic. These included five referred because of apparent dullness and backwardness at school, three with a stammer, two with eneuresis, one with fits, and seven with behaviour disorders. In the first group, one child had to be returned to United Kingdom in order to be educated at a special school. An hydrocephalic was brought to the clinic because the parents had been informed soon after the child's birth that an operation might be necessary to alleviate the condition. They had put off this decision for almost six years, and were now very guilty and worried that it might be too late. In many cases it was necessary to treat the parents rather than the child. The usual story was the only child with over-anxious and over-fussy parents.

In addition to seeing children at the out-patient clinics, Army Service Schools were regularly visited. The aim was to visit local schools at least once per term and schools at out-stations at least once per year. These visits were entirely informal. Generally the headmistress would refer six to eight children per visit, and to ensure that the interviews were considered entirely routine, one bright child and one average child were included in the list. During the short interview, the child was always tested for an I.Q. by the Herring revision of the

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Binet-Simon test. It was interesting to note that the results obtained in this way after ten to fifteen minutes were almost identical with the results obtained in the Moray House test, in those children who had taken the latter. After the interview, the teacher was advised how to deal with the child's particular problem, and occasionally an interview had to be requested with the parents. Some interesting clinical material was discovered at these school interviews, including two cases of crossed laterals, both in the same class at the same school, both producing problems to their teachers and parents.

SUMMARY

A survey of service psychiatry during 1951, in the Far East theatre, has been attempted.

Facts and figures have been produced, and ætiology, diagnosis and treatment of service men, their wives and children have been discussed.

The article has been confined to discussion of clinical rather than preventive psychiatry.

AN INSULIN COMA THERAPY UNIT IN A MILITARY PSYCHIATRIC DIVISION

BY

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THE unit described is at the Royal Victoria Hospital, Netley, and the period reviewed is the year 1951. The unit, in a somewhat similar form, was in operation for almost two years in Banstead Military Wing prior to its move to Netley. It is hoped that this account will be of some assistance to any medical officer in the Services who may in the future be given the task of setting up such a unit.

LAY-OUT OF UNIT

The accommodation occupied is part of the psychotic wing of the Psychiatric Division and is itself "closed" accommodation. It consists of a ward of 16 beds which serves as a dormitory at night and a treatment ward during the day, a day room, a sister's room, a sterilizing room, a food preparation room, annexes, three side wards with single beds, a padded cell and a medical officer's consulting room. Certain modifications are near completion which will greatly facilitate treatment, by converting a space just off the treatment room into a sterilizing room.

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Staff

The unit is in charge of the medical officer, who should have at least six months' experience before assuming full responsibility. Working with him is a second medical officer earmarked to take charge eventually. There are two nursing officers, one trained and one under training. The minimum experience of insulin training required for a nursing officer is six months. The other rank nursing staff are twelve, including a N.C.O. This gives a ratio of staff to patients of 1 : 1 (total staff) or 1 : 1.3 (for other rank nursing staff only). This apparently lavish scale of staff is adequately justified by experience.

During full treatment hours, Mondays to Fridays inclusive, all the staff, medical and nursing, are present. One nursing officer is always on duty and one medical officer within easy call. The other rank nursing staff (less one detailed for night duty and another on leave) work in two teams of five, each in charge of a N.C.O. or a senior orderly. Five nursing orderlies remain on duty in the afternoons and four work on the ward at week-ends (Saturdays and Sundays).

At night the nursing officer on duty in the psychotic wing supervises the unit. The insulin-trained orderly on night duty is supported by a mental nursing orderly from the general pool. Sometimes, owing to the presence of very disturbed patients, a third orderly is required at night.

Staff Replacement

The replacement of medical officers is subject to the usual service conditions, but every effort is made to retain officers employed in the unit for the minimum period of twelve months. Authority has been given for the "freezing" of trained nursing officers for twelve months and for the trained nursing orderlies for a period of nine months. Trainee nursing orderlies after two weeks' trial are given a further ten weeks' training. They then work three months as trained insulin orderlies and a further three months as senior orderlies. After nine months on the insulin ward the orderly is released to the general pool and his place taken by a trainee, thus building up a reserve of insulin-trained mental nursing orderlies. At any one time there are usually four orderlies under training.

The relief for the trained nursing officer when on leave or during other absences should be on the unit for at least two weeks before taking over. It is not sufficient that the relieving sister should have insulin experience ; it is most important that she should have first-hand experience of the reactions of each patient undergoing treatment.

Special Considerations of Staff

It has been said that the good results of insulin treatment vary proportionately with the morale of the medical and nursing staff working on the unit.

The staff are volunteers and selected. They work long hours, often in difficult circumstances, in heightened tension and often with very disturbed patients. The job will be well done and smoothly only if the morale among the staff is high.

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It is most important to establish the principle that all other military duties must be subordinated to the duties of the unit. The hours of active treatment, especially the critical hours of 0900 hours to 1100 hours, require the attendance of all staff, just as an operating theatre should have the full attendance of its staff during operations.

Besides the routine duties of nursing on a psychotic ward, there are the duties involved in the morning treatment, the cleaning, sterilization and the preparation for the next day's work. In addition, very careful observation is needed in the afternoons and evenings to ensure that there is adequate food intake, that "reactions" due to insulin are treated quickly, and that careful notes are made of the patient's behaviour. These observations will determine the dosage of insulin for the following day. Since all the staff must be on duty in the mornings, only half the staff is retained on duty in the afternoons and evenings so that adequate off-duty time is given.

The Nursing Officer in Charge, Insulin Unit.—The nursing officer is responsible for the over-all running of the unit in the absence of the medical officer. She pays particular attention to the cleaning and sterilization of instruments, to the maintenance of equipment, and to the standard of nursing. She decides what to refer to the medical officer in his absence and what measures to take in an emergency. Hers is the responsibility that the trainee orderlies have adequate instructions in their nursing duties. She personally issues parole passes to suitable patients and sees that they are adequately equipped with sucrose prior to leaving the ward. The nursing officer also maintains the day-to-day reports on treatment. She keeps a vigilant eye on the diets and on the food intake of all patients. All this is in addition to her routine duties as Nursing Officer in charge of a ward.

The Nursing Officer on Night Duty.—This officer gives the insulin injections and can decide to withhold treatment if the patient's condition during the night or early morning warrants this. She ensures that the sterilization of instruments and equipment and other morning preparations for treatment are up to schedule before she hands over the ward.

The N.C.O. Insulin Unit.—His particular duty is the detailed supervision of the nursing orderlies on duty, the collection and correctness of equipment and drugs from the dispensary, the upkeep of the blackboard during treatment, the cleanliness of the unit and the maintenance of a roster for off-duty time and leave for other rank staff. He keeps a particularly watchful eye on the trainees and on their handling of the patients both during and after treatment.

Other special duties performed by the nursing orderlies are :

Orderly in charge of Instruments.—He is responsible for the cleanliness, good order, sterilization and availability of instruments.

Dispensary Runner.—This orderly deals with the collection of items from the dispensary, diet sheets, diet trays, and "breakage and destruction" certificates.

Laundry Runner.—In addition to his laundry duties, he attends to fires and the disposal of rubbish (it is hoped to replace fires with central heating).

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Kitchen Orderly.—He collects and serves meals and helps to feed patients who on gaining consciousness find difficulty in starting breakfast. He is responsible for the maintenance of crockery and cutlery.

Annexe Orderly.—This orderly superintends the bathing and shaving of patients after treatment and is responsible for the cleanliness of annexes.

Orderly in charge of Feed Trays.—He prepares the trays for feeds during treatment and is responsible for the cleaning, sterilization and maintenance of all the equipment connected with feed trays.

Orderlies on Night Duty in Clinic.—In addition to the routine duties on a psychotic ward, these orderlies start the sterilization of the equipment needed for the morning treatment, take and record patients' temperature, pulse and respiration, and help the night sister to check and to give insulin and sodium amytal.

Equipment

The numbers after each item in the text below correspond with those in Appendix "A."

There is at present no authorized scale of equipment for a military insulin unit. The scale detailed in Appendix "A" to this paper has been adopted after two years of trial and error. The guiding principles in the selection of this equipment have been that it must be capable of effecting the rapid intravenous injection of large quantities of viscous solutions to approximately fifteen patients in the space of about one hour, and that it must be capable of standing up to the rapid and daily sterilization.

The task of ending, in a short time and in a darkened clinic, insulin-induced comas in patients, some very restless and excited, is one that demands that every single member of the staff knows his job and works closely to a set drill. This procedure can be compared to series of well-rehearsed operations performed at speed in a dimly lit theatre. The apparatus and instruments used in the clinic are of necessity laid out in a set place and pattern, and are described in detail in Appendix "B" to this paper.

Transfusion Apparatus

Twenty-c.c. syringes are not a satisfactory way of giving large quantities of dextrose or sucrose solutions. They are found to be cumbersome and, furthermore, the speed at which the injection must be carried out is incompatible with the degree of care necessary to ensure adequate sterility. Standard 540-c.c. screw-top transfusion bottles in which the sterile intravenous fluids are issued are used instead. A number of special metal screw caps have been made to fit the transfusion bottles. These caps have two hollow metal tubes soldered into the cap and project 1 inch inside. The tubes are bent at right angles outside to facilitate attachment to tubing (61). The cap has a milled edge so that it can be screwed tightly into place, thus obviating the necessity of putting pressure on the metal tubes when securing the cap. A bellows (23) is connected to one outer limb of the screw cap for forcing the solution out under pressure. To the inside

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of the other tube is connected about 9 inches of thick rubber tubing (60) so that it is just clear of the bottom of the bottle. To the outer limb of the same tube is connected one yard of transfusion tubing (61), the other end being attached to a 3-inch piece of glass tubing (62), which is in turn connected with a syringe by about 4 inches of transfusion tubing. The syringe (19) is a Kaufmann gravity pattern, consisting of 2-c.c. metal and glass barrel with a glass tube built in at right angles at the side near the needle end of the syringe. The rubber is attached to the glass tube. A 18G × 1½-inch needle (65) completes the assembly.

Needles

Narrow bore and long needles offer great resistance to the passage of such viscous solutions as those of 33 per cent. glucose and 50 per cent. sucrose. 18G × 1½-inch needles were chosen because of their comparatively wide bore and short length. A still wider bore needle would, of course, offer less resistance to the injection, but would be unduly difficult to insert into the vein of a collapsed patient. In an emergency either the 19G or even the 26G needles can be used on a Kaufmann syringe by means of an adaptor, but in the latter case the pressure bulb is insufficient to inject the solution and direct digital pressure on the piston would have to be employed. The use of an adaptor is generally to be avoided as it increases the danger of impaired sterility and of air injection.

For intramuscular injections, 19G × 2-inch needles are chosen because they are easily available and their length facilitates muscular penetration. They are also used for the intravenous injection of cardiazol or coramine.

Needles (64) for subcutaneous injections are of narrow gauge (26G) and very short (½ inch). These are selected to avoid the likelihood of intramuscular penetration and to prevent the too rapid injection of any solution.

The importance of the provision of really sharp needles cannot be over-stressed. The wear and tear on the morale of both staff and patients caused by blunt needles is something that can never, it seems, be adequately appreciated by those that supply them.

Syringes

The six 20-c.c. syringes (18) can be used to tide a patient over the crisis in coma when all the Kaufmann syringes are used and not yet re-sterilized. They are also useful for aspirating gastric juice, if there is a shortage of urethral syringes. It is interesting to speculate if the choice of the latter item for this particular function has been influenced by the psychiatrist's training in psychopathology!

Equipment for Tube Feeding

Tube feeding is normally carried out by the nasal route, using small bore œsophageal tubes (29). These require daily boiling and since, when soft, they are more likely to enter the trachea, one should be replaced each week when ten tubes are in use for eighteen patients. The sugar solution should be heated to 100° F. before being fed. If, however, nasal feeding is impossible due to extreme restlessness or spasms, and if intravenous interruption is inadvisable, a tube is

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passed by the œsophageal route. The conditions necessitating an œsophageal feed almost invariably call for the use of a gag (3 and 4). The ideal instrument to open the clenched jaw is the ordinary tablespoon. The handle is just the correct shape for inserting (curved upwards) under and up between the front teeth. A little manipulation, in which the handle is rotated until its edges are horizontal, separates the jaws sufficiently to enable the blades of the gag to be inserted. It is almost impossible by any means forcibly to open the jaw without the risk of damage to the front teeth. The metallic constitution of an ordinary cheap tablespoon offers an almost ideal compromise between strength and malleability.

Other items

Other items such as oxygen, tongue forceps, instruments for cutting down on a collapsed vein, tracheotomy set, etc., though rarely required, must be instantly available and ready for use.

Sterility precautions

A large (43) and a smaller (42) sterilizer are used for the instruments. The former takes the more bulky equipment, whereas the latter, which heats up more quickly, is used mainly for syringes and needles. Sodium bicarbonate, which destroys insulin, is not used as a preservative in the small sterilizer. Cheatle's forceps (10) are required for removing articles when sterile, and cellophane masks are used by the staff in the sterilizing room. Sterility is maintained by the liberal use of swabs dipped in methylated spirit soaking the operator's hands and the patient's skin.

All rubber tubing used in the assembly of the intravenous apparatus is, of course, boiled daily. It is essential to change all such tubing once a week because of the rapid deterioration in the rubber surface caused by the constant exposure to glucose solutions. It is impossible to sterilize satisfactorily rubber which has developed crevices below the surface. If particles or cloudiness appear rapidly in glucose solutions, the rubber tubing should be the first suspect.

Syringes are sterilized and stored individually in metal boxes, the metal containers for 20-c.c. syringes being a very suitable size. A number of these syringes in their containers, sealed in cellophane, are kept in readiness for emergency use during the day and night.

"Cutting down" and tracheotomy sets are re-sterilized at intervals and drums of sterile dressings (44) are maintained.

Selection of Patients

The majority of patients referred for treatment are from the admission ward and officers' ward of the psychotic wing, but some are selected directly from the psychoneurotic wing. Selection for treatment is made on the good prognostic points in relation to previous personality, duration of illness, type of illness, age, stress factors, intelligence, status, and response to modified insulin therapy. Most of the patients treated are schizophrenics, of good previous personality but

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with paranoid symptoms. Experience in this unit indicates that, in soldiers, schizophrenia of the paranoid type responds best to insulin coma therapy.

Most patients selected for insulin coma treatment have a course of modified insulin treatment in a special ward. Occasionally, however, when a vacancy in the insulin coma unit exists at the time of referral, and should delay in initiating treatment be considered inadvisable, the patient short circuits the modified insulin therapy ward.

Glucose tolerance tests are not carried out prior to treatment as the great majority of patients treated in the unit are young physically fit service personnel. In any case unsuitability on the grounds that would be indicated by such a test would be revealed in the initial modified insulin course.

Treatment Procedures

The night sister coming on duty ensures that the morning doses of insulin are entered in insulin dosage book, takes evening temperatures and ensures that patients have no access to food after the night drink at 2100 hours. The injections of insulin (80 units per c.c.) are given intramuscularly at 0600 hours together with sodium amytal by mouth for most patients. Refusals on the part of the patient of sodium amytal or of insulin are always accepted. The night sister also ensures that sterilization proceedure is well on the way when the day staff mount duty at 0730 hours.

The clinic is kept darkened but with sufficient light to enable the handling and assembly of instruments with the dark-adapted eye. A shaded bulb lights the treatment board on which are entered patients' names, particulars of treatment, times and duration of sopor and coma, times for termination of treatment, method of interruption and quantity and type of sugar solutions used. The patients are nursed on beds. The medical officer decides on the time and on the method of termination of each patient's coma. Nursing orderlies usually carry out nasal interruptions, the nursing officer œsophageal interruptions, but intravenous injections are performed only by the medical officer, using a head torch as an aid.

Six months ago a trial was made using ordinary cane sugar to end comas by the nasal and œsophageal routes. Formerly glucose, a much more expensive substance, was used for this purpose. Ordinary (cane) sugar has been used ever since with no apparent disadvantages but with considerable saving in expenditure. The sugar is supplied to the wards weekly in five-gallon drums in a 60 per cent. syrup. It is coloured red to discourage unauthorized users ! The 60 per cent. cane sugar syrup has additional advantages over a solution of dextrose in that it discourages bacterial and fungoid growth and will therefore keep well. The dextrose solution has the additional disadvantage that it must be prepared daily.

The Hypoglycæmic Period

The object of treatment is the production of a coma free from complications and of gradually lengthening duration from a few minutes to half an hour. It is

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not practically possible to induce coma every day with safety owing to the unpredictable factors of a patient's varying resistance to insulin, the variations in his mental state and intake of diet, the occurrence of minor infections, etc.

The determination of the existence and depth of sopor or coma is somewhat arbitrary. A lack of purposive reactions to stimuli, especially painful stimuli, is usually taken to indicate the onset of coma. Neurological reflexes vary too much to indicate adequately the onset of coma, but they help in determining its depth.

The onset of the following reactions, however, is regarded as requiring the termination of the coma by intravenous interruption :

Shock or exhaustion from excessive depth of coma or from excessive movements over a long period. This is indicated by cold or cyanosed extremities, a fast or weakening pulse, respiratory irregularities or a sudden drop in blood pressure.

Extensor spasms or respiratory stridor unrelieved by keeping the air-way clear. Waves of extensor tonus unrelieved by a clear airway and oxygen and which last for more than a minute. Generalized tremors and spasticity in a warm patient.

Epileptic fit.

Excessive secretions, i.e., "bubbling" in chest, or excessive saliva.

Failure of patient to recover twenty minutes after nasal or œsophageal interruption.

Any unusual reaction in the "coma pattern" of a patient.

The above signs are regarded as dangerous, requiring intravenous interruption irrespective of the neurological signs present. Nursing orderlies are taught that it is not necessary for plantar responses to be extensor or corneal reflexes absent to assess a patient as being in a coma. If the latter signs are present, deep coma exists and the patient must be closely watched for the "danger signs."

The efficacy of insulin treatment depends on the number and depth of comas that can be produced in a patient in the shortest period of time. This is a treatment that demands a careful assessment of the patient, meticulous attention to detail in sterilization proceedures, constant checking of equipment, the utmost vigilance of staff during treatment periods and skilful, patient nursing at all times. Any serious lowering of these high standards will surely end in catastrophe or will at best be shown in a poor recovery rate, with an accompanying deterioration in the morale of the staff and of the patients.

Special Nursing Points

Many of the patients selected for insulin therapy are in the early stages of their illness and, were they not having this treatment, they would not be nursed in a closed ward. Such patients may find the restrictions of a closed ward very irksome. The staff must make every effort to minimize ward restrictions for this group.

The majority of patients are of higher intelligence than many of the nursing staff and may contain a high proportion of officers and non-commissioned

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officers. It is very easy, even unintentionally, for nursing orderlies to adopt a superior or condescending attitude and this may have a harmful effect, especially on the more intelligent patients.

Since the paranoid type of schizophrenia appears to have the best prognosis with insulin therapy, compared with other service schizophrenics, paranoid reactions are very frequently met with in the clinic. It is, therefore, very important to avoid whispered conversations, which may be interpreted by the patient as referring to him, or laughing in the presence of patients where the cause of amusement is not generally apparent to all present. Paranoid patients are extremely sensitive and may take deep offence at what appears to be harmless "leg pulling."

The management of catatonic patients will require both skilful and tactful handling. Nursing orderlies must be taught to regard acts of aggressiveness not as personal attacks on themselves but as signs of the patient's illness. To overcome extremely negativistic attitudes of patients may require the greatest tact and perseverance on the part of the staff.

Very excited, violent or noisy cases likely to disturb the other patients at night are segregated in one of the side rooms away from the general ward. If required, difficult patients can be treated in one of the side rooms ; not a very satisfactory arrangement, since it is a big drain on staff.

Officer patients are seldom less than one-fifth of the total numbers undergoing treatment. Apart from the morning's treatment, officers remain in the closed officers' ward and are looked after by the staff of this ward.

Insulin treatment in the majority of cases will cause a very considerable increase in weight. This, together with the feeling of "sleepy relaxation" which follows treatment, inclines patients to "vegetate" in armchairs in front of the sitting-room fire. It is important to discourage this by getting patients out of doors in the afternoons either with escorts or by giving parole to the more stabilized. Much importance is placed in encouraging the better patients to re-establish contacts with the "world outside." Patients given parole are instructed in recognizing "insulin reactions" in both themselves and their companions. Their parole passes are reviewed daily by the medical officer, the parole time is rigidly adhered to and they are sent off in pairs or in larger groups well equipped with glucose, in the form of sweets and in solution. They are readily recognized outside the wards by their dress (hospital blues without tie) and by the large bottle of pink fluid in the pocket of their blue jacket.

Rehabilitation

The British Red Cross and Order of St. John workers do a great deal of essential work in the rehabilitation of these patients by organizing occupational therapy, concerts, library, social evenings, card games, outings and invitations for tea to local families. The Psychiatric Social Worker, as well as assisting the medical staff in the initial assessment of the patient, does a great deal in sorting out the patient's domestic troubles and in smoothing the path of his return to his home and to a job.

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Diet

Patients on insulin coma treatment require an increased diet as insulin causes a marked increase in metabolism, especially in carbohydrates. The total requirement for these patients is approximately 5,000 calories. The following items are supplied in addition to the scale laid down in "Appendix 'A,' Scale for Ordinary Diet for Men and for Boys over fourteen years of age in Military Hospitals, Military Hospital Dietary, 1951."

In addition to ordinary diet (expressed as quantities per patient per day) :

Bread	8 ozs.	Fruit juice ...	2½ fl. ozs.	Coffee	¼ oz.
Potatoes	10 ozs.	Ovaltine ...	1 oz.	Boiled Sweets ...	1 oz.
Tea	1½ ozs.	Biscuits	1 oz.	Eggs	3/7 oz.
Sugar	1 oz.	Milk (tinned) ...	1 fl. oz.	Jelly	1/7 oz.
Butter	1½ ozs.	Milk (fresh) ...	¾ pt.	Syrup	2/7 oz.

Results

These are the results for the year 1951. Records for 1950 are unfortunately not available.

Diagnosis	No. of Patients	Result			Disposal			
		Poor	Moderate	Good	R.T.U.	C.M.H.*	Own Care	N.O.K.†
Schizophrenia with V.D. Phobia	3		2	1			2	1
Schizophrenia, Paranoid ...	19	4	3	12		2	5	12
Schizophrenia, Hebephrenic	5	2	1	2		2		3
Schizophrenia, Catatonic ...	7	2	2	3		2	1	4
Schizophrenia, Simplex ...	2	2						2
Schizophrenia, Early ...	3		3		1			2
Hypomania	2	1		1	1			1
Schizophrenic personality with depression	1		1				1	
Psychopathic Personality ...	2		2				2	
Paranoid state	1			1				1
Depressive state	1			1				1
Total	46	11	14	21	2	6	11	27

* C.M.H.—Civil Mental Hospital. † N.O.K.—Next of Kin.

Average number of weeks under treatment: 10.3. Average number of courses: 33.3.

Records and Research

Daily treatment charts are maintained for each patient. These include details of temperature, pulse and respiration rates, drugs given, insulin doses, interruption, diet taken, and general behaviour in ward both by day and night. Weight and urine tests are recorded weekly. A weekly summary of progress is also recorded.

"Follow-ups" are carried out on every patient discharged at six-monthly intervals by means of a personal letter and an attached proforma. These are sent both to the patient himself and to a relative. These "follow-ups" are carried out by the Psychiatric Social Worker. In this way a large amount of data is being collected and is providing valuable material for research.

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Summary

The organization and operation of an Insulin Coma Treatment Unit in a military hospital is described.

A scale of equipment and a diet for this type of unit are presented in detail.

Acknowledgment

I am indebted to Colonel J. T. Robinson, *O.B.E.*, Officer Commanding, Royal Victoria Hospital, for his kind permission to publish this paper. I wish to place on record my appreciation of the enthusiasm, hard work and professional skill of Captain G. R. Duffes, R.A.M.C. (now released), whose efforts built up this Insulin Unit and whose notes I have freely used in this account.

Appendix "A"

SCALE OF EQUIPMENT FOR MILITARY INSULIN UNIT

Section 3A

1. Airway, anæsthetic, Water's medium	1
2. Case, Ward dressing, case, metal, empty	1
3. Gags, mouth, Doyen	2
4. Gag, mouth, Ferguson	1
5. Forceps, artery, S.W., 5-inch ...	2
6. Forceps, artery, S.W., 5-inch, box joint	1
7. Forceps, dissecting, ordinary, 5-inch	2
8. Forceps, dissecting, 1/2 teeth, 5-inch	1
9. Forceps, sinus, 6-inch	1
10. Forceps, sterilizer, Cheatle, 10½-inch	3
11. Holder, needle, Mayo, 7½-inch ...	1
12. Forceps, tongue, Corbould ...	2
13. Needle, aneurysm, left	1
14. Scissors, surgical, S.P., 5-inch ...	1
15. Syringes, hypodermic, R.P., 2-c.c. ...	4
16. Syringes, serum, R.P., 5-c.c. ...	2
17. Syringes, serum, 10-c.c.	3
18. Syringes, serum, 20-c.c.	6
19. Syringes, Kaufmann, gravity ...	4
20. Syringes, serum, 20-c.c., cases, metal for	19
21. Syringes, hypodermic, adaptor for (SIMA Cone to SIMA)	3
22. Scapel, 1¾-inch blade	1
23. Bellows, I.R.	4
24. Sphygmomanometer, mercurial, complete	1
25. Lamp, head, electric, Ever Ready ...	1
26. Lamp, head, electric, condenser for	1

Section 3B

27. Instruments, Emergency Tracheotomy, in tin box, complete set ...	1

Section 4A

28. Tubes, œsophageal, Jacques, size 24	4
29. Tubes, œsophageal, Jacques, size 10	10
30. Cylinders, gas, keys, universal for ...	2
30A. Connections, glass, 3-inch	10
31. Screw tops for 540-c.c. bottles, metal	4

Section 4D

32. Basin, dressing, E.I.K.S., 8-inch ...	1
33. Basins, dressing, S.S.K.S., 10-inch	12
34. Bowl, E.I., round, 6-inch	1
35. Bowls, E.I., round, 6-inch of sorts	6
36. Bowl, E.I., round, 8-inch	1
37. Bowls, E.I., round, 10-inch ...	2
38. Brush, nail, ward	1
39. Jugs, dressing, E.I., 10 × 7 inches, complete	3
40. Jugs, graduated, E.I., 1-pint ...	3
41. Jugs, graduated, E.I., 2-pint ...	2
42. Sterilizer, electric, 11 × 5 × 3 inches, complete	1
43. Sterilizer, electric, 20 × 10 × 7 inches, complete	1
44. Sterilizer, H.P., drums dressing, deep	3
45. Stand, urine test, complete	1
46. Trays, dressing, E.I., 11 × 9 × 2 inches	3
47. Trays, dressing, E.I., 13 × 10 × 2 inches	5
48. Tray, dressing, E.I., 14 × 11 × 2 inches	1
49. Tray, catheter, E.I., with lid ...	1
50. Thermometers, clinical	4
51. Thermometer, lotion	1
52. Syringes, urethral, glass, 4-oz. ...	6

Section 4E

53. Spatula, aluminium	1
54. Funnels, E.I.	10

Section 4F

55. Masks, B.L.B., Nasal	2
56. Gauges, pressure	2
57. Trolley, gas cylinder	1

Section 7

58. Stand, gas cylinder	1
59. Table, instrument, F.S. pattern with 2 S.S. shelves	1

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EXPENDABLE ITEMS

(Numbered in continuation of numbers on Inventory of Medical Equipment)

60. Tubing, I.R. anæsthetic	per week, yd.	1
61. Tubing, I.R. transfusion	per week, yds.	3
62. Tubing, glass, to fit transfusion tubing I.R. cut into 3-inch lengths, ends smoothed ...	to be held on ward	6
63. Needles, hypodermic, SIMA fitting, 19G × 2 inches	per week	48
64. Needles, hypodermic, SIMA fitting, 26G × ½ inch	per week	24
65. Needles, hypodermic, SIMA fitting, 18G × 1½ inches	per week	12
66. Gallipots		12

NOTES

Items requiring frequent replacement

23. Bellows, I.R.—one every 4 to 8 weeks.
28. Tubes, œsophageal, Jacques, size 24—1 per month.
29. Tubes, œsophageal, Jacques, size 10—1 per week.
31. Screw tops for 540-c.c. bottles, metal—reserve of 2 should be maintained.
52. Syringes, urethral, glass—the circumstances in which these are used inevitably entail high breakage rate; reserve of 6 should be maintained if possible.

Articles such as syringes which normally meet with rather frequent accidents in any department are even more vulnerable owing to the frequent necessity of using them on excited and restless patients.

APPENDIX "B"

SCHEME OF SETTING UP INSTRUMENTS IN CLINIC

A. TROLLEY

Top Shelf:

3 Kaufmann syringes, with 4 inches transfusion type rubber tubing and glass connection attached and 3 18G × 1½-inch needles, with adaptor if necessary, each set contained in metal syringe box with lid
2 bottles I.V. dextrose (glucose), pressure tops, bulbs
1 spare bottle I.V. dextrose
1 bottle I.V. 50 per cent. sucrose, pressure top, bulb
Gallipot containing spirit
Enamel bowl containing swabs
Jar with dissecting forceps in Dettol 1 part to water 3 parts
Mackintosh

Lower Shelf:

Receiver for used swabs
Receiver for used syringes and needles
Sphygmomanometer
2 mouth gags
6 rubber airways
Tongue depressor
Tongue forceps
Tablespoon

B. CORAMINE TRAY

Enamel tray, separate from A and C, with the following: 12 ampoules Coramine (variously labelled Nikethamide or Anacardone, but NOT Nicotinamide)

FILES

1 2-c.c. syringe and 1 5-c.c. syringe, each in metal box with lid, with 6 19G × 2-inch needles
Gallipot with spirit
Bowl of swabs
Jar with forceps in Dettol 1 part to water 3 parts
Bowl for used swabs
Receiver for used needles

C. ATROPINE TRAY

Enamel tray separate from A and B with the following: Atropine Sulphate, at least 24 × 1/100 grain or equivalent quantity of bulk solution

FILES

2 2-c.c. syringes, each in metal box with lid and 12 26G × ½ inch needles
Gallipot with spirit
Bowl of swabs
Jar with forceps in Dettol 1 part to water 3 parts
Bowl for used swabs
Receiver for used needles

D. CARDIAZOL TRAY (if instructed that it may be required)

Enamel tray (smaller than B or C and placed so as to avoid confusion)
Ampoules Cardiazol (also labelled Leptazol, Phrenazol) to total of 20 c.cs. 10 per cent. solution
1 10-c.c. syringe with 6 19G × 2-inch needles in metal box with lid
(Coramine tray (B) swabs and receptacles, etc., to be used)

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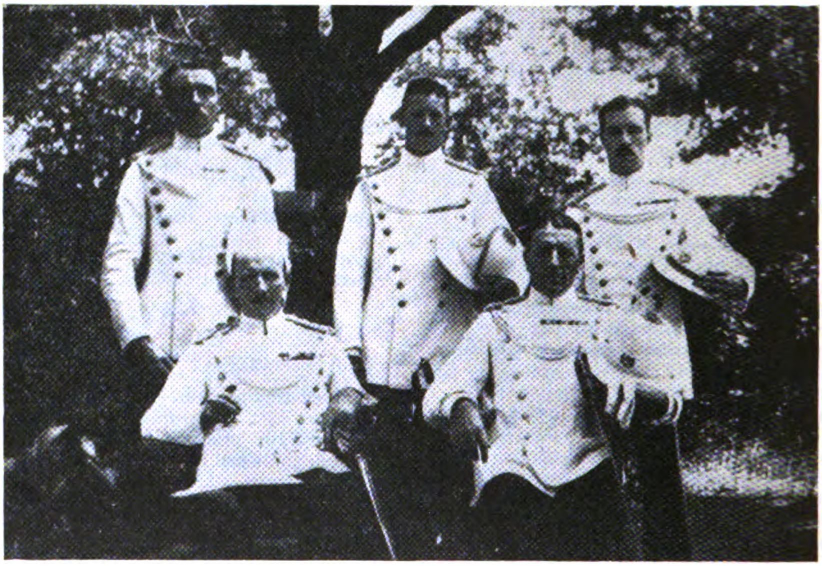
THE LATE SIR ROBERT GEORGE ARCHIBALD, C.M.G., D.S.O., M.D., MAJOR (Retd.), R.A.M.C.

BY

Lieut.-General Sir NEIL CANTLIE, K.C.B., K.B.E., M.C.

ARCHIBALD was one of that select band of R.A.M.C. officers who served in the now almost forgotten Egyptian Army of the pre-1914 days. Service in the Medical Corps of the Egyptian Army was one of the much sought after plums of those days, but the outbreak of the First World War caused disappointment to many because they were not allowed to leave the Egyptian Army for service



overseas. "Archie," as he was always called, left the Corps early in his career in order to succeed Sir Andrew Balfour as director of the Wellcome Research Laboratories in Khartoum, an appointment which indicated how highly his capabilities were regarded. For the next sixteen years he directed this important establishment and his name became well known in the realm of tropical medicine. With Byam, also a Major in the Corps, he collaborated to write *The Practice of Medicine in the Tropics*, and he devoted an increasing amount of time in later years to agricultural research, to the benefit of the cotton-growing industry which has done so much to further the prosperity of the Sudan.

"Archie" was the soul of honesty and no research worker was more critical of his own efforts. He was painstaking and meticulous, as research workers must be, and so enthusiastic that he sacrificed many a leave home to continue some absorbing subject in which he was immersed. I last met him in Alexandria in

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1950, where he was then Professor of Bacteriology, an appointment he had taken up after his retirement on age from the Sudan service.

The photograph, which includes Archibald, was taken in Khartoum in 1920 on the occasion of a levee held at the Palace.

Archibald is seated in front on the left, and on the right is Miralai Clarke Bey, Principal Medical Officer of the Egyptian Army. The names in the back row, reading from the left are, Bimbashi N. T. Whitehead, Bimbashi B. H. H. Spence and Bimbashi N. Cantlie. Bimbashi Spence is now Sir Basil Neven-Spence, former M.P. for Orkney and Shetland. The dress is the full dress of the Medical Corps of the Egyptian Army.

BLOOD PRESSURES AND COLD PRESSOR TESTS IN PSYCHONEUROTIC PATIENTS

BY

Captain J. B. EAGLES, M.B.

Royal Army Medical Corps

Army Operational Research Group

THE relation between emotion and blood pressure is well known. Both normal subjects and subjects with benign essential hypertension respond with an increased blood pressure to the stress of an emotional situation. During a medical examination most patients' blood pressures fall as they become more at ease and acclimitized to the unfamiliar procedures. Under conditions of absolute rest and quiet the blood pressure may fall very far below its initial value, and then respond with a large rise to a very slight stimulus (1).

From this sort of evidence, it might be expected that psychoneurotic patients would show large "emotional" variations in blood pressure, and this has been found in some cases (10). It is not, however, clear whether this is true of all psychoneurotics or only of certain groups (3).

Taking advantage of a visit to a military hospital for another purpose, it was decided to record the blood pressure in 70 psychoneurotics and to perform the cold pressor test on 22 of them. The interpretation of the cold pressor test, the reaction of the blood pressure to plunging the hand in ice-cold water, is controversial, but it may be taken as a measure of the lability of the blood pressure. It probably acts as a convenient form of painful stimulus (9).

METHOD

Blood Pressure Readings

Blood pressure readings were made on 70 psychoneurotic patients. The subjects were all soldiers, most of them between the ages of 18 and 25 (see Fig. I). Blood pressure readings were taken with the subjects seated. Systolic and

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diastolic pressures were determined by auscultation, the diastolic end point being taken as the point at which sounds became muffled. No attempt was made to put the subjects at their ease. All readings were made during one morning, and the subjects were almost paraded to the examination room. No explanations were offered, since the aim was to heighten rather than to decrease the emotional stress of the examination.

Cold Pressor Tests

These tests were done after the manner of Hines and Brown (7), except that our subjects were seated and not lying down. The subject was first rested until his blood pressure reached a steady resting level; this usually took from ten to

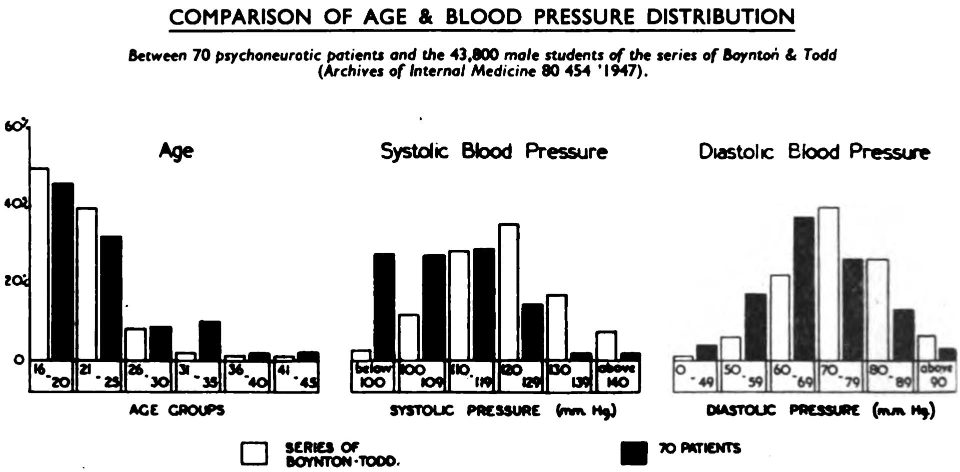

FIG. 1

fifteen minutes. Then the blood pressure was recorded on the left arm, while the right hand was immersed in ice-water for one minute, and subsequently during its return to normal in one to two minutes. The maximum response to the stimulus was recorded.

RESULTS

Blood Pressure

The results of the single blood pressure readings are set out in Fig. 1 in comparison with histograms drawn from the data of Boynton and Todd for a large population of male students (4). These data are used for comparison because of the good agreement in age distribution with our series, which can be seen in the figure.

The comparison of diastolic pressures is of little moment; the pressures of the patients are distributed in a very similar pattern but at a slightly lower level than those of the students. On the other hand, the comparison of systolic pressures shows a striking difference which is highly significant statistically. In our

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series there are many more subjects in the lower pressure groups than there are among the students. For example, over 50 per cent. of the patients had systolic pressures of under 110 mm. Hg., compared with less than 20 per cent. of the students. Similarly 80 per cent. of the patients and only 40 per cent. of the students have systolic pressures below 120 mm. Hg.

The same anomaly is reflected in the means of the two groups. The mean diastolic pressure of the psychoneurotics is 67.0 m.m. Hg., compared with 75.5 mm. for the students. The patients had a mean systolic pressure of 107.2 m.m. Hg. compared with 122 mm. for the students.

The Cold Pressor Test

The results of this test carried out on 22 subjects are recorded in Appendix "A". In response to the stimulus there is a mean rise in systolic pressure of 9.3 mm. Hg., and a mean rise in diastolic pressure of 13.2 mm. Hg.

It is not easy to compare these results with normal values since criterai of normality in this test have been subject to a good deal of unresolved discussion (9). However, certain points emerge with striking clarity. The mean rise of diastolic pressure is higher than the mean rise in systolic pressure, and this reflects the fact that the stimulus caused a higher rise in diastolic than in systolic pressure in 15 subjects. This is the reverse of the usual finding, and I have not been able to find it reported in the literature. In over 1,000 normal subjects Hines found a mean diastolic rise in the cold pressor reaction of 13.2 mm. Hg. (6). This is exactly the same figure as in the present series. But the mean systolic rise in the 1,000 subjects of Hines was 16.2 mm., as compared with 9.3 mm. in the present group of psychoneurotics. Finally, without any direct comparison available, the fall of the systolic pressure while resting prior to the test is surprisingly low in many cases—in 12 subjects the systolic pressure fell by less than 5 mm. Hg.

Discussion

The results of the casual blood pressure readings on 70 patients, and the cold pressor tests carried out on 22 of them, fit together very well, and combine to convey the irresistible impression that the systolic pressure is lower than normal and less responsive to the stimulus of cold-pain. This is all the more striking because the diastolic pressure is comparatively unmoved; there is reasonable agreement between the diastolic pressures of our patients and those of Boynton and Todd's students, and the mean rise of diastolic pressure in our subjects was exactly the same as that of the subjects of Hines in the cold pressor test.

The age distribution of our series approximates very well to that of Boynton and Todd's. But to take all factors into consideration the diurnal cycle of blood pressure must be considered. The blood pressure is higher in the morning than in the afternoon (5). Our subjects were all examined in the morning. It is not stated at what time readings were made in the large series of students. However, even if all the students were examined in the late afternoon (which is unlikely), I do not think the discrepancy between the systolic blood pressures of the two series would be explained, especially as no attempt was made to put the psycho-

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neurotics at their ease, whereas in a series of routine medical examinations in the Health Service from which the records of Boynton and Todd are derived, it can reasonably be expected that reassurance and even resting would be practised. I am certain that the reason for their results must be found elsewhere than in the daily cycle of blood pressure.

Alvarez and Stanley found much lower blood pressures in 6,000 prisoners than in their 400 guards (2). It may be that this provides a clue to our present problem. Like the prisoners, our subjects were, to some extent at least, cut off from the outside world. Moreover many of our subjects were strikingly depressed, a mood which may well have been shared by many of the prisoners. Examination of clinical records available on a few of these patients suggests that there may be a relationship between systolic blood pressure and a psychiatric assessment of depression, the more depressed patients having the lower pressures. More work would be needed on a larger sample than that of the present pilot experiment before the question could be answered satisfactorily. Nevertheless it seems very probable that psychic factors can lower and stabilize the systolic pressure, just as they can raise it and render it more labile.

As mentioned in the introduction, blood pressures showing increased lability and large temporary elevations have also been described in psychoneurosis, especially in the effort syndrome. Such findings are not incompatible with the present results. It is possible that anxiety may be associated with elevation and lability of the blood pressure, whereas lowering and stability may be characteristic of depression. Bousfield made a somewhat similar distinction when he described elevation of the blood pressure in anxiety states and a tendency to hypotension in "neurasthenia" (3).

Two further points call for comment. In the present experiment diastolic pressures did not differ greatly from normal. This bears out statements in the literature which suggest that the systolic pressure is much more influenced by psychological factors than the diastolic (8). Finally, attention should be drawn to the 25 per cent. of patients who had systolic pressures below 100 mm. Hg. This is another piece of evidence that low blood pressures have little or no pathological significance. Many of the cases of "low blood pressure" quoted in journals and demonstrated in practice may have been cases of psychoneurosis.

Acknowledgment

I wish to thank the D.G., A.M.S., and the Superintendent, A.O.R.G., for permission to undertake this work and to publish it.

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Appendix "A"

RESULTS OF COLD PRESSOR TESTS

(1) Subject No.	(2) Initial B.P.	(3) Resting B.P.	(4) Maximum B.P. due to cold stimulus	(5) Rise in B.P. due to stimulus (4–3)	(6) Fall in B.P. on resting (2–3)
1	104/58	88/54	86/58	–2/4	16/4
2	100/74	92/72	106/84	14/12	8/2
3	104/66	92/58	100/68	8/10	12/8
4	105/80	100/68	110/80	10/12	5/12
5	90/58	88/56	102/74	14/18	2/2
6	106/74	104/72	108/78	4/6	2/2
7	128/74	112/74	116/78	4/4	16/0
8	84/58	86/58	92/68	6/10	–2/0
9	100/60	105/75	100/80	–5/5	–5/–15
10	118/70	104/68	124/100	20/32	14/2
11	102/60	100/58	110/84	10/26	2/2
12	86/58	90/58	94/70	4/12	–4/0
13	96/64	92/64	102/74	10/10	4/0
14	118/70	108/70	124/84	16/14	10/0
15	96/56	94/56	110/78	16/22	2/0
16	145/85	130/78	150/100	20/22	15/7
17	118/78	114/70	130/80	16/10	4/8
18	100/64	90/62	94/70	4/8	10/2
19	110/60	108/70	110/80	2/10	2/–10
20	122/68	118/68	115/80	–3/12	4/0
21	96/60	92/56	108/68	16/12	4/4
22	90/65	86/55	106/74	20/19	4/10

Mean rise in Systolic Pressure (col. 5)—9.3 mm. Hg.
Mean rise in Diastolic Pressure (col. 5)—13.2 mm. Hg.

THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES

The Sixtieth Annual Meeting of this Association will be held at the Statler Hotel, Washington, on 9th, 10th and 11th November, 1953. The President of the Association invites any R.A.M.C. officer who wishes to attend the convention, and announces that any officer doing so will receive honorary membership of the Association.

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MORE INDIAN CANTONMENT SANITATION

THE article "An Attempt to Modernize Indian Cantonment Sanitation" by H. J. M. C. in the June, 1952, issue of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS brings to mind a rather similar incident which occurred at the C.M.H., Barrackpore, in 1945.

At that time most of the patients in the hospital were "dysentery" or "skins," consequently disinfection of linen was of major importance. The disinfector was situated in the British Wing, but was administered by the Indian Wing, and I was assured by them that a very capable Lance-Naik (Lance-Corporal) was in charge. From outward appearances everything seemed to be going very well; great bundles of soiled linen were being taken daily to the disinfector and religiously returned to the wards the same evening. But even then I was rather apprehensive about the inner working of the disinfector. In my prowls round the hospital compound I invariably found the place locked, no sign of activity within and no peculiar odour which emanates from a disinfector at work.

So you can appreciate that I was not surprised when a Nursing Officer on one of the skin wards told me that she suspected that the linen which she sent for disinfection never went through a disinfector. I thought, here is where I act, and, as the police reports say, "observation was kept on the premises." Early one morning I managed to force an entry and surprised the rather sleepy Lance-Naik. He greeted me with much bowing and salaaming. I asked him if the disinfector was working and he assured me with much nodding of head that it was. I had a look round the place—the disinfector looked anything but a working model; it was covered with dust, both water taps were broken and no amount of coaxing could produce a drop of water. The petrol stove was in pieces and lay in one corner of the building. I explored still further and opened one compartment of the disinfector. It smelt pretty high and I asked the Lance-Naik to let me see the contents. He produced a conglomeration of rags, half-empty tins of beans and pilchards, stale bread and a varied collection of pots and pans. I looked into the other compartment and nesting therein was a hen on a clutch of eggs who was very indignant at being disturbed.

I grabbed hold of the hen and threw it at the Lance-Naik with all the force I could. There was much squawking and both made a dash for the open door. I then grabbed the eggs and pelted them at the Lance-Naik one at a time. He was running round in circles, imploring my mercy and trying to dodge the fusillade—very few missed. The hen was careering madly around, making futile endeavours to collect her liquidated family. I kicked the rubbish out of the building and, with each kick, the Naik grabbed his belongings, including the dispossessed hen. The last I can remember is a well yolk-spattered Naik running as fast as he could to the Indian Lines with all his possessions, including the displaced hen on his head, frequently glancing back at a Britisher suddenly gone mad.

I mentioned it casually to my Commanding Officer the following morning by saying that I had replaced the Lance-Naik in the disinfector by a British other rank. For days I expected repercussions from the Indian Wing, but there were none. R.S.Ms. invariably get away with it. J. P. O. C.

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A NOTE ON NATIONAL SERVICE AND CRIME

BY

Lieut.-Colonel C. B. R. POLLOCK
Royal Army Medical Corps (retd.)
Medical Officer in H.M. Prison Service

On numerous occasions it has been suggested that the recent increase in crime and the rise in the prison population may be connected with the introduction of National Service. This idea is not unreasonable. The increase in crime has occurred chiefly among the young and compulsory service is a new element in the life of the younger generation.

I decided to see whether the notes which I keep would throw any light on this subject. I have been working for the last nine months in a Corrective Training prison. Corrective Training is a form of sentence introduced by the Criminal Justice Act, 1948. Section 21 of this Act provides

(1) Where a person who is not less than 21 years of age

(*a*) is convicted on indictment of an offence punishable with imprisonment for a term of two years or more and

(*b*) has been convicted on at least two previous occasions since he attained the age of 17 of offences punishable on indictment with such a sentence

then, etc., etc., he may be sentenced to corrective training for a period of not less than two and not more than four years.

These are minimal qualifications. There are no upward limits of age or wickedness, but as, in this type of prison, maximum emphasis is laid on training and minimum on retribution, sentencing authorities do not as a rule sentence older men to corrective training, as their characters are no longer sufficiently malleable.

Thus nearly all the inmates, all in this series anyhow, have either done or been exempted from National Service. Those who did not serve were either in reserved occupations or rejected on medical grounds.

My source of information is some record cards which I have been keeping. These cards were designed to answer a number of miscellaneous questions and were not designed primarily to answer the question under investigation.

The following questions on the *pro-forma* were relevant :

(1) Whether the man had served in the Royal Navy, Army or R.A.F.
(2) Whether on a voluntary engagement or on National Service only.
(3) Whether he had succeeded in completing the engagement which he had undertaken, whether National Service or Regular.

The cards show only failure to complete an engagement and do not show whether that engagement was Regular or National Service. Nor do they dis-

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tinguish between discharge on medical and other grounds. As every officer knows, the distinction between the man invalided out and discharged "Her Majesty having no further use for his services" can be very fine. A useless soldier with a well-filled crime sheet may find himself invalided by a Medical Board as "a psychopath with anti-social tendencies" or discharged on disciplinary grounds. The only way to be certain is to write to the War Office or Officer i/c Records. Where I have done this, I have received very full and prompt information, but I have shrunk from imposing the burden of an inquiry concerning each individual ex-service prisoner.

The other type of information to be discovered from the record cards is the age of first conviction. This is recorded as between 18 and 16, between 16 and 13 or under 13. I did not have room to record the age above 18 of first conviction nor whether the first conviction happened during or after service. This may be rectified in later printings of the cards.

It is also possible to argue that the age of first conviction is no index of the age at which criminal habits were first formed. The man may have been an active juvenile criminal for years before he was first caught, or the first conviction may have been for nothing more serious than kicking a football about in the street. However, some definite point had to be taken to serve as the starting point of a criminal career, and I selected the age on first conviction for this purpose. I decided, perhaps arbitrarily, that where the first conviction had occurred before 18, the influence of the service could not be blamed for subsequent lapses. When the first conviction occurred later, National Service might have contributed to his downfall.

The results of the inquiry are as shown in Table I.

TABLE I

	No.	*Percentage*
Number of cards examined	168	
Number of those first convicted after 18 years of age	55	32
Number of the above-named who served in the Army	107	
Number of Army men first convicted after 18 years of age	27	25
Number of men who served in Royal Navy	11	
Number of those first convicted after 18 years of age	5	45
Number of men who served in R.A.F.	10	
Number of those who were first convicted after 18 years of age	4	40
Number never in the Forces	40	
Number of those first convicted after 18 years of age	19	47

I must confess that the result surprised me. It appears that a man who serves in the Army is about half as likely to take to crime subsequently as if he served in the Royal Navy, R.A.F., or in no service, yet ex-army personnel contribute five-eighths of the number surveyed. These men were selected for survey, quite at random.

I next broke down the ex-Army group a little further. I naturally expected to find that a very much higher proportion of those who completed their service without being thrown out would have had a clean subsequent record than those who failed in the Army. The actual findings appear at Table II.

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TABLE II

	No.	*Percentage*
Total Army cards	107	
First convicted after 18 years of age	27	25
Completed N.S. engagement	32	
First convicted after 18 years of age	9	28
Completed a voluntary engagement	8	
First convicted after 18 years of age	2	25
Failed to complete his engagement for any reason	67	
First convicted after 18 years of age	16	23

It appears that those who fail to complete their Army engagements have a slightly better chance of avoiding imprisonment subsequently than those who complete their engagement.

Those results were unexpected, so I went one step further and looked at the age of first conviction of all the ex-Army prisoners and of the rest. The numbers of ex-Royal Navy and R.A.F. were too small to be significant and in Table I they approximated much more nearly to the civilian pattern than the military. The results have therefore been drawn up in two groups only, ex-Army and the rest. Here again the picture is surprising. A much greater proportion of ex-Army prisoners were first convicted before the age of 18 than after. Among the rest the finding was quite the reverse. This appears in Table III.

TABLE III

	No.	*Percentage*
Army	107	
First convicted over 18 years of age	27	25
First convicted under 18 years of age	13	12
First convicted under 16 years of age	32	30
First convicted under 13 years of age	35	33
Rest	61	
First convicted over 18 years of age	27	44
First convicted under 18 years of age	10	16
First convicted under 16 years of age	13	21
First convicted under 13 years of age	11	18

(These figures must be offset against Table I.)

CONCLUSION

Statistics are notoriously susceptible of being interpreted in contradictory directions and the number of histories here considered is small. They are histories only of a special class of prisoner who might be described as the Junior Recidivist. Therefore I make no pretence that this note throws any light on the general problem of criminality. But I think one may say that there is nothing in this series of histories to suggest that Army service is likely to foster criminal habits or be a cause of recidivism. There is even a suggestion that it may have some influence in the opposite direction.

I am indebted to the Prison Commissioners for permission to publish this note, but such permission does not indicate that the views expressed represent in any way the views of the Prison Commissioners.

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IS ROUTINE CIRCUMCISION ADVISABLE?

BY

Colonel T. E. OSMOND, M.B.

Late Royal Army Medical Corps, retired

THE examination of large numbers of soldiers, most of them National Service men, provided a good opportunity to note the condition of the prepuce. The following table indicates the types of prepuce in 1,095 cases.

N	C	P	P+
416 38 per cent.	377 34 per cent.	217 20 per cent.	85 8 per cent.

N = Normal, i.e., the prepuce did not completely hide the glans penis.

C = Circumcised.

P = Long prepuce covering the glans penis but retractable.

P+ = Long prepuce which could not be retracted or only with difficulty ; in several cases the aperture in the prepuce was hardly more than pin-hole.

From the above figures it appears that 20 per cent. of these soldiers would have benefited from circumcision and 8 per cent. needed it ; if the 377 circumcised men are excluded, the respective percentages would be 35 and 14. In most of those with long prepuces there was a large collection of smegma, and this suggests that more thorough teaching of personal hygiene is needed at centres where recruits are trained. The ignorance of these young soldiers is remarkable; many of them expressed surprise at the condition revealed when they retracted their foreskins ; some of them had apparently never done so in their lives.

The foregoing is not meant to be a plea for the circumcision of every male baby ; opinion seems generally against it, partly because it is impossible to decide at a very early age whether it is necessary. It is fairly generally agreed, however, that the circumcised are less liable to contract venereal disease than the uncircumcised and most young men are more liable to exposure in service than in civilian life ; moreover the glans penis should be washed as often as the rest of the body. It does seem that all young National Service men should receive adequate instruction in personal hygiene when they first join, and those with foreskins which cannot be retracted should be advised to be circumcised.

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Correspondence

68 Eccleston Square,
London, S.W.1.
14*th July*, 1953

SIR WILLIAM HORROCKS

Sir,

I should like to add a few words to the tribute, by Sir Brian Horrocks, to the memory of that thoroughly great man, his father. I met him first in 1899 (and the future Sir Brian, then aged four, and the latter's charming mother) at Netley, when I was one of those beings less than anybody else in the Army (as we were instructed by our seniors), a Surgeon-on-Probation. Men banded together in classes of instruction, as we were at Netley then, are apt to view their instructors with a critical eye and classify them as genuine men and others, and in the eyes of us S.O.Ps. Horrocks was unquestionably in the former class. I met him later at the R.A.M. College and in the 1914-18 war. and in the latter had the experience of hearing him attack his superior officer in very strong terms for forbidding me to continue with a certain line of treatment which I was trying with reasonably good results, or at any rate without harm to anyone. At such times one learns whom to respect and whom to, well ——! Horrocks was not a yes-man and equally he was by no means a can't-be-done man, and if one wanted help and advice in any project for the good of the Service, Horrocks was there as a tower of strength. I never believed that his services with the Mediterranean Fever Commission were nearly sufficiently recognized. With Zammit he clearly proved in 1905 that goats were the carriers of Malta Fever infection, and when one thinks of the enormous wastage of military manpower which was stopped by that discovery, one must conclude that the knighthood conferred on him in 1918 was twelve years overdue. And I could never understand why the Royal Society did not make him a Fellow; I have known men of much less scientific attainments possessors of that great honour. Just after the war of 1914-18 we collaborated in designing a centre for abortive and early treatment of V.D. to be established close to every barracks. It was a pleasure to see how quickly he could spot the good and weak points of a building plan. When we had finished it, he told me that the sappers responsible for putting up C.C.Ss. in France had said bitterly that it would have paid the Government well to give the consulting surgeons £10,000 a year each to stop at home rather than let them have their way with plans which later events proved that had not been able to read, though they had been too proud to acknowledge the fact. Finally, I would say that if all the men of the world were as straight and as wise as was W. H. Horrocks, life would be a much simpler business than it is.

I am yours, etc.,

L. W. Harrison.

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BUREAU OF HYGIENE AND TROPICAL DISEASES,
KEPPEL STREET,
GOWER STREET,
LONDON, W.C.1.
14th July, 1953

DEAR COLONEL NEAL,

We have read with great pleasure the note you published on the 50th volume of the *Tropical Diseases Bulletin*, and we very much appreciate the congratulations you paid to it. (The date should read 1912-1953.)

I should like to assure you that we at the Bureau have always taken a great interest in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, and, as I am sure you remember, we frequently publish abstracts of the papers which appear in it.

We in turn congratulate you on the 50th anniversary. We look forward to a long and vigorous life of the Journal.

Yours sincerely,

CHARLES WILCOCKS,
Director.

Editor, Journal of the Royal Army Medical Corps

ROYAL NAVAL MEDICAL SCHOOL,
ALVERSTOKE,
HANTS.
23rd July, 1953.

The Editorial Staff of the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE send greetings and congratulations to the Editors of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS on the 50th anniversary of publication.

J. G. MAGUIRE,
Surgeon Captain R.N.,
on behalf of the Editorial Staff.

OFFICIAL APPOINTMENT

MALARIA FIELD OFFICER required by the TANGANYIKA GOVERNMENT Medical Department on probation for permanent and pensionable employment. Commencing salary (including present temporary allowance of 30%) according to experience in scale £715 to £1,092 a year. Outfit allowance up to £45. Free passages. Liberal leave on full salary after tour of 2/3 years. Candidates, not over 40 years of age, should be adaptable and educated to Matriculation standard preferably with some biological knowledge. Some experience in mosquito control, field engineering or general preventive medicine will be an advantage.
Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M3A/33841/JE.

Male Orderlies required. Salary £6 : 5 : 0 plus extra for Sunday work. Full residential emoluments provided for 33/- weekly if required. Apply Matron, Winchfield Hospital, Near Basingstoke, Hants.

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Matters of Interest

TOBRUK 41

THE seventh annual Officers' Dinner will be held at the Connaught Rooms, London, on Friday, 20th November, 1953. The Guest of Honour will be General The Lord Freyberg, V.C., G.C.M.G., K.C.B., K.B.E. D.S.O. Details from Major-General C. E. N. Lomax, C.B., C.B.E., D.S.O., M.C., 7 Pittville Crescent, Cheltenham, Glos.

FIFTH INDIAN DIVISION

THE Eighth Annual Dinner of the Officers' Dinner Club will be held on Friday, 9th October, 1953, at Simpson's in the Strand, London, W.C.2. Dress : Dinner jacket, uniform, or lounge suit. Tickets 16s. 6d. (members) and 21s. 6d. (non-members). Further details and particulars of membership from Hon. Secretary, 5th Indian Division Officers' Dinner Club, c/o Messrs. Glyn, Mills & Co. (Holt's Branch), 22 Whitehall, London, S.W.1.

PAPERS BY R.A.M.C. OFFICERS

Andrew, Captain R.: Epidemic Hæmorrhagic Fever. *Brit. med. J.*, (1953), i, 1063-1068.

Barnsley, Major-General R. E.: Regimental Badges. *J. Soc. Army Hist. Research* (1953), **31**, 46.

Chalke, Lieut.-Colonel H. D.: Modern Methods for the Control of Tuberculosis. *Med. Officer* (1953), **89**, 183-189.

Edwards, Lieut.-Colonel G. F.: The Toxic Manifestation in the Treatment of Tuberculosis with *para*-aminosalicylate. *Tubercle* (1952), **33**, 369.

Edwards, Lieut.-Colonel G. F.: The Place of Chemotherapy in Planned Treatment Regimes for Pulmonary Tuberculosis. *Tubercle* (1953), **34**, 42.

Evans, Lieut.-Colonel F.: Using Sump Oil as Fuel. *Newnes Practical Mechanics*, April, 1953, pp. 281-2.

McCullagh, Colonel W. McK. H.: Trichomoniasis and the Gap Seat. *Lancet* (1953), i, 698.

MacFarlane, Colonel L. R. S., and Captain C. H. Jones: Protection against Tuberculosis of Medical Personnel in the Army. *Tubercle* (1953), **34**, 188-191.

Book Reviews

MEDICAL HISTORY OF THE SECOND WORLD WAR: ARMY MEDICAL SERVICES. Administration, Vol. I. F. A. E. Crew, F.R.S. H.M.S.O. 1953. Pp.xxii + 530. 50s.

When writing war histories it must be tempting to plunge straight into the stream of events following mobilization. Professor Crew, resisting this temptation, has enhanced the value of this book by describing the difficulties of the inter-war years. The story of the overcoming of these difficulties and of others which came with the war will help us to avoid similar pitfalls in future.

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When describing the lack of field training in the R.A.M.C., beset with shortages, the author, as a distinguished and stimulating C.O. of a University O.T.C. unit, might perhaps have mentioned the work in this field of our Territorial brothers.

Reading the section on the Hartgill Committee many may find their gratitude to the committee for a flexible field ambulance and the invaluable F.D.S. tempered with thankfulness that they were never told how they were supposed to employ these units. It is surely incorrect to say that all medical units in Normandy were "disposed entirely in conformity with the Hartgill Scheme." The objections raised to the scheme are mentioned but not described.

The review of a fine book, like the confidential report on a good officer, should refer with benign tolerance to weak points. The only one I noted is the inclusion among the illustrations of a Tyburn-like erection for hauling casualties from A.F.Vs. The text rightly indicates that such devices have absolutely no place on the battlefield, but a casual reader might be misled by the picture to waste time elaborating similar absurdities.

The subject-matter makes this a book to dip into rather than to read straight through. There is something to interest and benefit everyone. It is moreover written in a delightfully easy style—the only concession to official jargon being the use of the horrible but useful verb "to hospitalize"—and by an author with an evident love for the Corps and pride in its progress from the early difficulties to the fine service which earned the high praise which Sir Neil Cantlie in a foreword says "has never before been the reward of the medical services."

F. M. R.

CLINICAL PROBLEMS OF WAR. (Australia in the War of 1939-45. Series 5 (Medical). Vol. I.) By Allan S. Walker, M.D., Ch.M., F.R.A.C.P. Pp. xxiv +726. 88 illustrations. Canberra: Australian War Memorial, 1952. 35s.

This important work is the forerunner of four volumes to be issued on Australian medical problems in the 1939-45 war. The book is divided into three parts covering Medicine, Surgery and Special Subjects. More than half of the total pages allotted to Medicine are concerned with the so-called tropical diseases. The sections on malaria and the dysenteries are especially noteworthy and it is interesting to contrast our own experience with that of the Australian Army. There are admirable accounts of the typhus group, environmental conditions and pyrexias of unknown origin.

In the next part the rapid war-time development of new methods in all branches of traumatic surgery is described. The sections on chemotherapy, traumatic shock, blood transfusion and anæsthesia are excellent. Included among the special subjects in the third part are a vivid description of malnutrition and an interesting account of improvised methods of medical and surgical treatment in captivity.

Some may argue that the scope of this book is too wide and that no thread binds these series of reports together. However, I found Dr. Allan Walker's

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account of the clinical problems of war fascinating and written in a clear and easy style. The carefully chosen illustrations, maps and diagrams make this a remarkable book. He and the publishers are to be congratulated on producing a valuable addition to the library on war medicine.

W. R. M. D.

TEXTBOOK OF MEDICAL TREATMENT. By Various Authors. Edinburgh : E. and S. Livingstone. 6th Edition, 1953. Pp. xvi + 1023. 50s.

Because of the rapid advance in the treatment of medical disorders, the appearance of a new edition of this standard work, under the editorship of Professor D. M. Dunlop, Professor L. S. P. Davidson and Sir John McNee, is more than welcome. The 28 well-known contributors writing from the Universities of Edinburgh, Glasgow and St. Andrews maintain the Scottish flavour of previous editions. Major-General Sir Alexander Biggam has been responsible for the excellent section on common tropical diseases.

This book is much more than a list of treatments for various conditions. The pathological basis and the clinical picture are delineated so that the rationale underlying the various treatments can be appreciated.

The chapters on Tuberculosis, Tropical Diseases, the Care of Old People, Nutritional Disorders, Nephritis and Psychotherapy have been completely re-written and new chapters on Chemotherapy, Rehabilitation, Treatment of Poisoning and the Chemotherapy of Malignant Disease have been added. The book is surprisingly up to date.

This edition is eminently readable—the printing is clear, the diagrams excellent and the quality of the radiographs is outstanding. There is a very interesting chapter on Technical Procedures in medicine.

The dose of all modern drugs is expressed in the metric system only, whilst for the older galenicals the approximate dose in the apothecaries' system has been included in brackets after each metric dose.

It can be safely said that every doctor would profit from a perusal of this book. The clarity of expression, the definite and authorative presentation of a regime of treatment, the wide range of conditions discussed make this book a most valuable asset for doctors in all branches of clinical practice.

R. J. G. M.

B.C.G. VACCINATION. W.H.O. Monograph Series No. 12. W.H.O., Geneva. 1953. Pp. 307. Paper covers. 15s.

This monograph is a study of B.C.G. Vaccination in school children carried out in Denmark, Egypt, Mexico and India. Comparative results of vaccination reactions and allergy are given in the various countries, by different techniques and by different methods of reading results.

Results from different methods of preparing vaccine, both as to media and bacterial constitution, are given and there is an interesting chapter on the effects

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of storage and bright sunlight on the vaccine. An interesting point is made that allergy to tuberculin is quantitative and not qualitative. Slight allergy to tuberculin can be given by non-specific conditions at present unknown. The importances of a minimal permissible allergic reading for positivity in performing a Mantoux test is therefore apparent. It is a pity that circumstances prevented laboratory tests running *pari passu* with the field trials.

L. R. S. M.

MANUAL OF NUTRITION. Published for the Ministry of Food, Scientific Adviser's Division, by H.M.S.O. 3rd Edition, 1953. Pp. 58. 2s.

This is the third edition of this excellent Manual, which was first written in 1945 for use in teaching the principles of nutrition to people already possessed of practical knowledge of cooking and catering. It is stated in the Preface that no attempt has been made to teach chemistry, physiology, or any other basic subject upon which the science of nutrition is founded ; nevertheless, the Manual is an invaluable (and cheap) reference book for medical officers, particularly for Specialists in Army Health, and indeed for all concerned with the feeding of the soldier.

To make it easier to use the Manual for instruction, it is divided into four parts, each comprising a number of lessons and a set of questions.

There are two useful appendices, one giving the composition of common foodstuffs, the other a list of supplementary reading matter.

R. J. N.

The Editor regrets that space does not allow of printing reviews of the following :

THE ANATOMY OF THE AUTONOMIC NERVOUS SYSTEM. G. A. G. Mitchell. Pp. 356. Edinburgh : E. & S. Livingstone. 55s.

REHABILITATION OF THE PHYSICALLY HANDICAPPED CHILD. First Report of the Joint Expert Committee on the Physically Handicapped Child (W.H.O., etc.). Technical Report Series No. 58. London : H.M.S.O. Pp. 26. 1s. 6d.

REASON AND UNREASON IN PSYCHOLOGICAL MEDICINE. E. B. Strauss, M. A., D.M., F.R.C.P. Pp. xii+56. London : H. K. Lewis. 1953. 8s. 6d.

BROMPTON HOSPITAL REPORTS, VOL. XXI. Pp. vii+206. Aldershot: Gale & Polden. 1952. 15s.

THE POCKET PRESCRIBER. A. G. Cruickshank. 15th Edition. Pp. xv+294. Edinburgh : E. & S. Livingstone. 1952. 5s.

CONCISE PHYSICAL CHEMISTRY. J. E. Wynfield Rhodes. Pp. 196. London : English Universities Press. 1952. 12s. 6d.

MOLLUSCIDES. A. Mozley, D.Sc., Ph.D., F.R.S.E. Pp. viii+87. London : H. K. Lewis. 1952. 9s.

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EDITORIAL NOTICES

Original articles, notes and letters bearing upon either the medical or the military aspect of the work of the Corps will be gladly received. All papers intended for publication should be typewritten (*not* duplicated), double-spaced and fully corrected. Proofs are not sent to authors serving out of the United Kingdom.

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